ELECTRICAL REVIEW

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IN THIS ISSUE

Exalting the Valleys	**1139**
Crawley New Town. By H. Pryce-Jones, M.Eng., M.I.C.E., M.I.E.E., M.Inst.F.	**1141**
Views on the News	**1145**
New Books	**1146**
French Electricity Supply	**1147**
Light for Seeing. By Sam Black, F.S.M.C., F.A.A.O.	**1149**
Personal and Social	**1153**
Correspondence	**1157**
Parliamentary News	**1159**
Industry and the House. By T. F. Cook, M.P.	**1161**
Statistical Approach	**1163**
Toronto Subway	**1165**
Coal Burning Gas Turbines	**1167**
Commerce and Industry	**1169**
Overhead Line Erection. By G. R. Lomax, A.M.I.E.E.	**1175**
Engineering in Europe	**1177**
Electricity Supply	**1179**
Financial Section	**1181**
Next Week's Events	**1185**
New Patents	**1187**
Contract Information	**1189**
Classified Advertisements	**119**
Regional Guide to Electrical Contractors	**137**
Index to Advertisers	**140**

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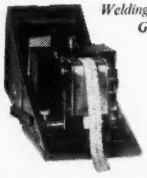
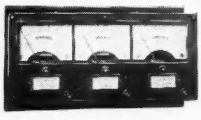
Some other instruments...

Battery Charge Indicator

Neutral Displacement Relay



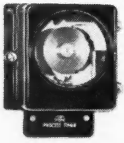
Welding Cycle Grapher



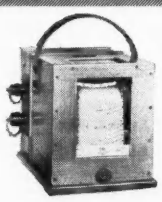
3-phase High Speed Maximum Reading Ammeter

500kV Electrostatic Voltmeter

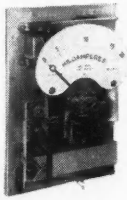
Marine Type Overload Relay



"Weathering Test" Cycle Controller



Railway Speed Grapher



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ELECTRICAL REVIEW

VOL. CXLIX No. 3863 7TH DECEMBER, 1951

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Exalting the Valleys

HEATING COULD BE A USEFUL LOAD

THE electricity supply industry is, of course, not the only one with a peak-load problem, local passenger transport providing perhaps the closest analogy. The problem has come to the fore as a direct consequence of the shortage of generating plant. In considering ways of mitigating its effects, it is of the utmost importance that any emergency expedients should not be confused with the needs of long-term policy.

Basic features of electricity supply have been, first, the statutory obligation to meet the public's electrical requirements and, secondly, to do so at prices that can be kept low only if plant is well loaded day and night. Originally the main function was to meet the essentially peak demand for lighting, which varied seasonally and from day to day according to the weather.

Domestic Space Heating

Overall costs decreased when supplies were given for motive power and later by the development of the domestic load with its high diversity which very considerably raised the overall load factor.

The domestic load, however, included one component, heating, which resembled lighting in its characteristic dependence of demand upon weather conditions. There was the important difference that electric fires were not then used to any material extent during the height of winter, when coal fires were burning, except for supplementary purposes during rare times of prolonged frost. Formerly such periods could be tided over by relying on the overload capacities of generators, or by running old sets. Now that all plant of whatever kind may be called upon every day in the winter for prolonged operation, there is no margin of this kind.

Balance Disturbed

Although the contribution made by electric fires to peaks is often grossly exaggerated, their effect has been much more pronounced in recent years, the main reason being uncertain deliveries of insufficient quantities of poor household coal and unauthorized connections of portable electric fires to make up the deficiency, since warmth is a fundamental necessity of life. The result is to disturb the economic balance of the industry, because—as Mr. W. E. Burnand has recently shown in an analysis of the peak-load position and of methods proposed for alleviating it—the supply of electricity for peak loads can never be economic. Previously they were well within the limits of what could be regarded as

part of the service given to consumers and allowed for in the tariffs of the undertakings.

During the past few years the unrivalled convenience of electric heating has been discovered by millions of consumers and its long-hour use could materially improve load factor. Nevertheless, whatever the plant situation or electrical application under consideration, a level load curve should be the object in view. The investigations and experiments now being carried out by the British Electricity Authority and the Electricity Boards have important long-term aspects in which as far as possible price incentives should have the fullest scope. In their bearing on the future, the exalting of the valleys rather than restriction of peaks should be the main line of approach.

GAS TURBINE DEVELOPMENTS

One of the chief merits of the gas turbine is that its components can be varied to give an optimum balance between capital and operating costs. The flexibility thus obtainable can make it independent of water and also give it a portable character to suit temporary sources of gas. At present, dependence on oil restricts its field in this country. However, the account of exploratory work now in hand to adapt combustion arrangements to the use of coal, which was given by Dr. H. Roxbee Cox in his Thomas Hawksley Lecture at the Institution of Mechanical Engineers (reported in this issue), offers considerable promise for the future. This belief is supported by the present activity of leading electrical manufacturers in this country in building prototype turbines, a number of which are due for completion early next year.

STATISTICAL TECHNIQUE IN ENGINEERING

Engineering decisions are largely concerned with the taking of risks in regard to factors too complex or too variable in their incidence to lend themselves readily to exact calculation. Statistical methods, which deal with aggregates and not individual items, provide in many cases a short-cut substitute for the long experience usually necessary to differentiate between legitimate risks and rash assumptions. In his paper to the Supply Section of the Institution of Electrical Engineers last week Mr. R. B. Rowson drew attention to the especial value to electricity supply engineers of this technique in that it permits experiments and the separation of the various factors involved to be made under working conditions.

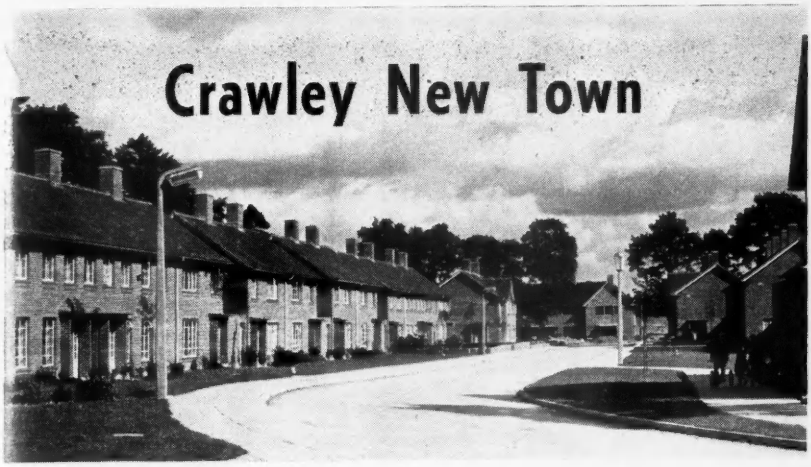
CLASH OF INTERESTS

On the face of things, the decision of the Hereford Chamber of Commerce to expel the Midlands Electricity Board from membership is logical. Chambers of Commerce are primarily, if not wholly, organized to protect the interests of private-enterprise businesses and the inclusion of publicly-owned bodies seems to be incompatible with this object. In the Hereford case the Board was accused of unfair competition with other members, specifically in the matter of hire-purchase terms, but several members who spoke were against the continuance of the Board's membership on general principles. There is one possible argument in favour of representation of the public services in Chambers of Commerce: it is that the other members are able to raise questions and obtain expert advice on subjects which may affect their businesses considerably. But this postulates that the public boards which are represented must stick closely to their primary objects and not encroach upon the field of private enterprise.

STEEL FOR AUSTRALIA

An announcement that the United States has decided to suspend shipments of sheet steel to Australia for six months raises a question for British manufacturers. The principal sufferer will be the Australian motor car industry, but producers of refrigerators and washing machines are said to be badly affected also. An Australian spokesman has stated that small supplies of steel at prohibitive prices could be obtained from Japan. It had not been possible to secure steel from Great Britain but negotiations were proceeding. From the British point of view it would be better business to provide finished products rather than the raw material for them. But if these products are acceptable to Australia is the Government able and willing to allocate sufficient steel to British manufacturers to enable them to meet the demand?

Crawley New Town



Electrification Scheme for Community of 60,000

By **H. PRYCE-JONES**, M.Eng., M.I.C.E., M.I.E.E., M.Inst.F.*

THE first of the new towns to be commenced under the New Towns Act (1946), Crawley, lies 22½ miles north of Brighton on the main London–Brighton Road. The new town is being constructed by the Crawley Development Corporation, a statutory body created for the purpose under the Act. The supply of electricity and its associated engineering work is the responsibility of the South Eastern Electricity Board.

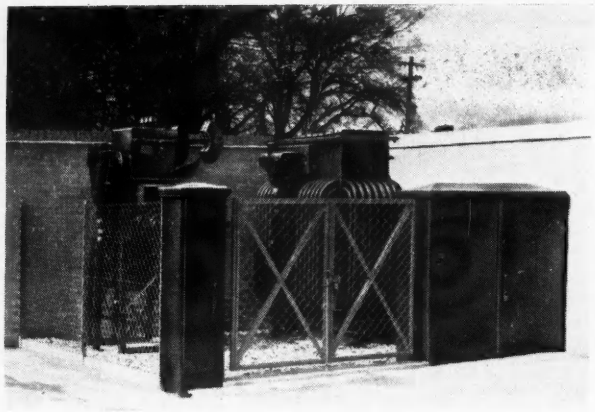
The town was originally intended to cater ultimately for a population of 50,000, but this has now been increased to 60,000. The plans for the electrical development, originally based on the figure of 50,000, are accordingly being progressively modified as necessary to allow for the increased population.

The new town is to be completely self-supporting. It will comprise a civic centre, a central commercial block, an industrial site and nine balanced "neighbourhood units," each with its school and cultural centre. The town is scheduled for completion in about fifteen years, and the electricity supply system is being designed and installed by the Mid-Sussex Sub-Area of the South Eastern Electricity Board.

The existing town is fed from the B.E.A. South Eastern Division's 132/33 kV substation at Three Bridges by means of duplicate 33 kV lines to Crawley and Horsham. Supply to the new town will be taken at 11 kV from a new 33 kV bulk supply substation which the Electricity Board will construct on a site adjacent to the grid substation at Three Bridges. The existing Crawley 33 kV substation will be dismantled and the Horsham/Three Bridges 33 kV feeder probably diverted south of the new town to make way for housing development on the route of the present lines. In anticipation of the additional load on the Three Bridges grid point, considerable reinforcement of the existing grid substation has been scheduled. It is proposed during the second stage of development to establish another 33/11 kV transformer station immediately to the west of the new

* Manager, Mid-Sussex Sub-Area, South Eastern Electricity Board.

Title picture is a view of a residential district, Smalls Mead, showing street lamps



Standard industrial outdoor transformer site in Compton Way

town. The design and construction of the network for Crawley New Town is planned in three stages related to the progressive anticipated maximum demand from all consumers (domestic, commercial and industrial). Each stage will cater for a maximum demand of about 20 MVA, though this figure must, of course, depend largely upon the actual development of the industrial load.

By means of perimeter rings and radial feeders, electricity will be distributed over the area of the new town at 11 kV. Control of this system will be by ring main isolators at all transformer sites and fully protected oil circuit breakers at points of supply and other strategic positions. For this h.v. network standard cable sizes of 0·2 sq in and 0·1 sq in have been selected.

The general arrangement of the low voltage distribution is based on the principle of laying initially a reasonably uniform network and injecting into this by commissioning 500 kVA substations as the load demands. The design of the l.v. network is such that the cables laid to deal with the loads envisaged in the first stage of the plan will be capable of handling the loads of later stages with a minimum of reinforcement. So far as possible one distributor only will be laid in each road and capacity will be increased as required by the addition of suitably placed transformer points. Some forty substations of standard 500 kVA capacity will be required to deal with each of the three stages, making 120 in all.

Considerable discussion has taken place between officers of the Development Corporation and the Board's engineers in respect of the siting and design of the distribution substations envisaged in the master plan. During these discussions, strange though it may seem, it was found that, presumably for psychological or æsthetic reasons, the term "substation" was not good currency and, for ordinary distribution substations, the title of "transformer site" has by mutual agreement been adopted, with the result that site negotiations have often been facilitated.

A particular transformer site of a standard type, wholly outdoors, has been designed by the Mid-Sussex engineers and accepted in principle by the Development Corporation. Considerable care is exercised on both sides to ensure that the transformer sites are technically correct and in harmony with their surroundings. By suitable treatment in wooded environment or embodiment in screen walls, these transformer sites are rendered pleasing to the eye and to date approval has been given by the Development Corporation to the construction of the first six.

From the outset the Board has endeavoured to interest the Development Corporation in the adoption of a consumer's house service unit which would marshal in orderly fashion the service equipment to be installed by the Board and also the consumer's main distribution apparatus. This has been achieved by the design to the Crawley architects' requirements of a sheet metal box suitable for mounting in the external wall or partition wall of each house just inside the front door. The unit finishes flush with the wall and a hinged door on the front gives access to the Board's service cable termination and meter in the lower half and the consumer's main switch and distribution board in the top section. The Development Corporation will be installing this unit in all residential

roperties in the new town as a standard omponent of the electrical installation.

The installations in the new houses will rovide the tenants with good facilities for aking use of the electricity supply. In ddition to adequate lighting points the orporation is providing special circuits r cookers and socket outlets for portable ppliances. The outlets are installed on ing mains using the new standard 13 A omestic fused plug. In all houses with a olid fuel hot water system, the hot tank which is lagged with an insulating jacket) as a boss for the fitting of an immersion eater and with few exceptions, immersion eaters have, in fact, been fitted by the Corporation in houses already constructed.

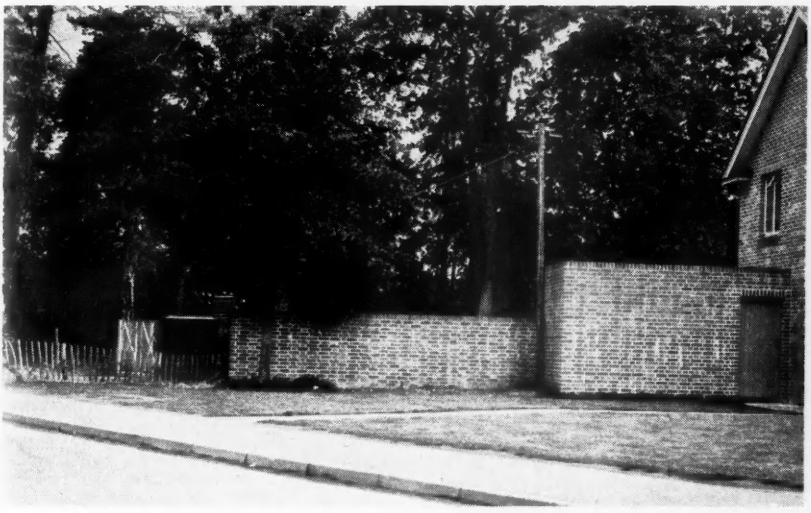
When a firm has arranged to move its factory and personnel to Crawley, the Corporation's housing manager calls on each family to ascertain its housing needs. In due course when the new factory and the houses are nearing completion, prospective tenants are notified of the house that is available for them and they are invited to view it on a certain day.

On viewing day, the new tenants have many final details to settle so the Board's district manager, who is furnished with a list some days before, arranges for each tenant to have full details before viewing day of the electrical facilities, including a budget of the estimated electricity costs. Wherever possible this is done by an interview at the prospective tenant's existing address, otherwise a letter is sent. The advantage of giving this advance information is fully felt on viewing day when a mobile showroom is taken to the housing site. In the mobile showroom, tenants can arrange for the connection of the electricity supply and select from a representative range of electrical appliances. They are shown how to replace fuses in the house service unit and plug tops and each one is given a card with which to notify the district manager of moving-in date.

On occasions, with the co-operation of the firms concerned, it is possible to take the mobile showroom to the London factories, thus establishing contact with future Crawley residents at an early stage. This policy is indicative of the vigour with which, despite the damaging handicap of load shedding, the gospel of domestic electrification is being preached by the South Eastern Electricity Board.

Until an urban district council is created to administer the new town, responsibility for street lighting lies with five parish councils. In these circumstances a working party to consider all aspects of the problem

This transformer in Ifield Road was the first to be commissioned in the first of the new towns. Note how well it blends into the surrounding trees



was constituted from representatives of the parish councils and the Development Corporation, with the latter's chief engineer and the writer as technical advisers. The working party has presented an interim report to the lighting authorities concerned, recommending the use of the fluorescent type of lamp in the new 40 W 2ft size, two to a fitting on a concrete column. The Development Corporation has undertaken to pay for the initial installation of the street lighting system in developed roads, on condition that the appropriate lighting authority will meet energy and maintenance costs. Supply will be given at the Electricity Board's interim street lighting tariff.

All street lamps will be connected to a fifth core included in the l.v. distributing mains and switched in groups by time switches incorporated in special street lighting units which are provided where required at transformer sites. No final decision has yet been made as to the type of lantern to be adopted, but it is possible that both horizontal and vertical units will be used dependent on the situation.

At the end of September 867 houses and flats were either completed or actively under construction and of these 355 were connected to the electricity supply.

Because of the widely varying requirements of factories, transformer sites cannot be planned in advance, as for residential areas, but have to be decided upon as the loads to be met become known. To date the undermentioned firms have intimated their requirements:

Firm	Type of Industry	State of Factory	Service Capacity kVA
A.P.V. Co., Ltd.	Vessels for brewing, dairy and food trades	Under construction	2,000
F. H. Bourner & Co. (Eng.), Ltd.	Domestic and industrial water fittings	do.	100
W. C. Youngman, Ltd.	Wooden industrial equipment and bathroom fittings	Completed and in production	250
Young, Randall & Co., Ltd.	Sugar and chocolate confectionery	Under construction	300
Vitamins, Ltd.	Medicinal foods	do.	500

The above factories are being built independently by the respective firms. In addition the Development Corporation has built a standard factory which has been leased in units, with an aggregate service capacity of 585 kVA, to the following firms:

Aerox, Ltd. (ceramic filters); Bale & Church, Ltd. (cleansing paste); British Liquid Inks, Ltd. (inks, oil and paints); O. Burridge & Co., Ltd. (colour printing); K. H. C. Graham & Co., Ltd. (instrument and clock cases); Johnson & Bloy, Ltd. (metallic inks, pastes and varnishes); A. S. Ladley, Ltd. (liquid flow meters); National Marking Machines, Ltd. (marking machines); P. & B. Engineering, Ltd. (electrical instruments); Rediweld, Ltd. (plastics); Test House Equipment, Ltd. (aeronautical instruments); Vaughan Lift & Engineering Co. (lifts and hoists); and E. Walters & Sons (instrument cases).

A second standard factory site is now in course of development in the new town.

Method of installing house service unit

Service Centre Training Courses

THE South East Scotland Electricity Board has just completed two five-day training courses for its service centre assistants. The objects of these courses were to afford the assistants an opportunity of discussing problems of mutual interest and to provide information on the latest developments in electrical appliances to enable them to give the best possible service. Appliances, models, films and lantern slides were used to illustrate the talks.

VIEWS on the NEWS

By REFLECTOR

ONE of electricity's chief attributes is the ease with which it can be controlled, but in a Frazerburgh hospital it seems to have got completely out of hand. It was reported at a meeting of the North-Eastern Regional Hospital Board (Scotland) that with tubular electric heating the building became so hot that windows had to be opened to cool it down. Immediately that was done, however, the thermostat operated and the process was repeated. (A Glasgow paper's version is: "The thermostat started consuming electricity again at a terrific rate.") The hospital's electricity bill was £700 or £800 a year. It was proposed to substitute a hot water system which would cost only £350 a year to run. Nobody seems to have suggested adjustment of the thermostats. This sort of thing may be prevalent in Scotland, for a member of the Board mentioned another hospital which was "like an oven."

* * *

Instead of worrying about where the next kWh is coming from we should be warned by Mr. A. Manning, "a native of Great Brington," who has discovered the cause of most modern ills: it is electricity. Mr. Manning has told the *Northampton Independent* that he believes that underground streams and anything electrical, including cables, send out rays which have a harmful effect on health. He explains:

> "You see, these rays earth your vitality and when your vitality has gone, anything can happen."

Since he discovered these rays, in 1945, Mr. Manning has travelled in twenty counties protecting houses from their effects. The newspaper describes the very elaborate method employed. He detects the rays by means of a small steel ball on a chain and having found them temporarily puts them out of action by placing a coil of copper wire in a wooden case in a certain position on the floor to "earth" the rays. Then he goes outside and after further use of this little steel ball buries some more copper coils and a bottle of eucalyptus (this is a protection against overhead lines).

* * *

Electricity Boards appear to be reluctant to introduce special tariffs for night water heating although by doing so they would secure a desirable load and relieve the morning peak. The subject was raised at a recent meeting of one of the district committees of the South Western Regional Board for Industry and it was decided to approach the South Western Electricity Board on the matter. There was a protest at a women's meeting in Bath when a Ministry of Fuel official suggested that water heaters should be used at night and switched off in the morning. It was objected that this would increase electricity bills too much. This is true enough, even if tanks are well lagged, and the situation can be met only by a special night rate. I think that the Electricity Boards should consider this, although I realize that some expense is involved.

* * *

With the price of the metal round about £176 a ton it is not surprising that the theft of lead is becoming a common crime. Several churches have been deprived of their roofing and the stealing of lead-sheathed cable from yards has been reported quite frequently. So far no thief has been bold enough to attempt to remove buried power cables but the next best (or worst) thing has occurred in Bushy Park, Middlesex. There about 25ft of lead-covered telephone cable, installed at a depth of three or four feet, was recently removed, depriving 600 subscribers on the Molesey exchange of their services. Knowledge and organization were required for a theft of this kind. Those responsible must have known where the cable was and 25ft of 800-pair cable, about 3in in diameter, requires some pulling out and handling.

NEW BOOKS

The Electric Current. By P. Dunsheath, C.B.E., M.A., D.Sc., F.Inst.P. Pp. 211; figs. 68; plates xxii. G. Bell & Sons, Ltd., York House, Portugal Street, London, W.C.2. Price 18s 6d.

This well-produced volume is based on a course of six lectures delivered by the author to juvenile audiences at the Royal Institution during the 1949–50 Christmas holidays. It is well known that these Christmas lectures, in a series founded by Michael Faraday, employed a wealth of experimental demonstration to present the subject in an attractive and interesting way. This book is written in the same vein for (not down to) children, although it is highly likely that many grown-ups will derive much useful information from its pages.

Without entering into complicated and unnecessary detail the fundamental principles of almost the whole field of modern electrical science are explained and its development is briefly traced from Galvani's twitching frogs' legs to the latest types of turbo-alternators. Undoubtedly this is an excellent book for children and all others who wish to learn something of electricity without becoming involved in a lot of mathematical detail. The rather high price is no doubt a reflection of the many illustrations.—R.P.

Foundations of Wireless. By M. G. Scroggie, B.Sc., M.I.E.E. Fifth edition. Pp. 328; figs. 236; index. Published for *Wireless World* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 12s 6d.

Since it was first published in 1936 this book has become established as a classic in its field. The present edition—the fifth—has been entirely rewritten and is illustrated with over 200 new diagrams. The basic theory of radio is well covered, starting with the most elementary principles. No previous technical knowledge whatever on the part of the reader is assumed and mathematics is eschewed except where essential.

Apart from the fundamental laws of electricity and radio, the theory of valves, transmitters and all types of modern receivers is described, and there is an introduction to the techniques of television and radar, while aerials, power supplies and transmission lines also receive attention. A feature of interest to the beginner is the introductory section which explains fully the use of algebraic symbols, graphs and circuit diagrams. Equally valuable is the comprehensive system of indexing and cross-referencing, enabling the reader to find any information (and particularly the meaning of both British and American technical terms) without difficulty.

Semi-Conducting Materials. Proceedings of a conference held at the University of Reading under the auspices of the International Union of Pure and Applied Physics in co-operation with the Royal Society. Pp. xv + 281; figs. Butterworths Scientific Publications, Ltd., Bell Yard, Temple Bar, London, W.C.2. Price 40s.

One is confronted, upon opening this handsomely produced volume, with the dilemma present in the case of all symposia. Does the quantity of material useful to one in one's particular specialization which it contains justify the by no means modest price? A glance at the contents page reveals many papers of small interest to the engineer. However, owing to the growing importance of semi-conductors many of the investigations described have considerable relevance to electrical engineering. For example, W. Shockley contributes perhaps the best semi-advanced introduction yet to transistor (crystal triode) action in germanium and on transistor and other effects in lead sulphide. A group of papers on selenium considers this element in connection with blocking-layer photocells and other possible applications. Another survey article describes engineering and chemical aspects.

Altogether this book resembles a Christmas pudding, from which everyone should be able to pick out a plum or two, but most of us will have to leave quite a lot behind.—P.L.D.

Books Received

Training and Promotion in Nationalized Industry. Pp. 138; index. George Allen & Unwin, Ltd., Ruskin House, 40, Museum Street, London, W.1. Price 10s 6d.

Patents, Designs and Trade Marks. By C. S. Parsons. Pp. 184; index. Technical Press, Ltd., Gloucester Road, Kingston Hill, Surrey. Price 14s.

French Electricity Supply

Relations Between Electricité de France and "Free" Producers

WHEN the Law of 8th April, 1946, nationalized the production of electricity in France, and placed this service under Electricité de France, the Legislature provided for certain exceptions.

In the first place, the French National Railways Company (S.N.C.F.) and also the National Coal Mines (Houillères Nationales) receive special treatment, inasmuch as they retain the ownership of their plants and production, but their production services are managed under the authority of a mixed committee. The Compagnie Nationale du Rhône (Génissiat power station) is to be liquidated under a special Law which has not yet been passed.

Stations Excluded from Nationalization

In the second place, a "free sector" is maintained in existence. Originally this sector comprised only small power stations with an annual production of less than 12 million kWh. However, a Law of 2nd August, 1949, raised this limit by laying down that in future the criterion should be an installed power of 8,000 kW, and also by including in the sector those power stations which worked by the recovery of surplus power, whatever their capacity might be. In addition, new power stations with a capacity of more than 8,000 kW may in future be established by industrialists for their own purposes, provided that they are of only subsidiary interest from the point of view of the public service. The arrangements for these power stations are governed by a special regulation.

Thus the electric power which is distributed in France is mainly supplied by the power stations of E.D.F., and, to a smaller degree, by those sources of power which have not been nationalized, and by imports.

Out of a total output of electricity in France during 1950 which amounted to 33,390 million kWh, E.D.F. distributed from its own hydraulic output, 12,646 million kWh; from its thermal stations, 8,557 million kWh; from its purchases abroad, 234 million kWh; and from its purchases in France, 4,769 million kWh. Out of the last figure the Génissiat power station accounted for 1,383 million kWh, and the National Coal Mines for 1,416 million kWh.

Purchases from public undertakings or national companies, such as the railways, the coal mines, or the Compagnie Nationale du Rhône, are governed by special agreements owing to the special character of these bodies and the size of the amounts which they supply.

Other purchases (apart from imports, which are occasional in character) are in the first place, from small hydraulic producers, who sell the whole or part of their output. In the second place there are the surpluses of producers of thermal power. These producers are as a rule industrialists, who find it convenient to make use of the surplus steam, blast-furnace gas, etc., produced in the course of their main operations.

Sales to E.D.F.

The purchases from the producers in the "free sector" represent something of the order of 860 million kWh per annum, of which 450 million is of hydraulic and 370 million of thermal origin. At the time of nationalization E.D.F. set up national scales of seasonal prices for such purchases. These scales were subject to contractually fixed supplements, depending on the guarantees which the producer could offer, and they have therefore not been entirely satisfactory to the producers.

Most of these producers had the advantage, before nationalization, of a guaranteed outlet for their power in the sense that it could be used to supply their own works or distributing systems. Now this previously existing state of balance in their operations has been disturbed and the producers have scarcely any alternative except to offer their output to E.D.F.

The latter has therefore decided to re-examine the question, and is moving in the direction of applying the following principles.

It will undertake to buy at a fixed price certain supplies of power, namely:

(*a*) Supplies from producers who before nationalization had a market for their power, but cannot now rely on that market because of nationalization.

(*b*) Power from producers who take from E.D.F., at some point in the territory covered, supplies which are regarded as equal in value.

The scale of purchase prices would comprise a fixed sum, plus a supplement varying according to the time of day, and the season, i.e., summer and winter. These prices would be further variable according to the districts. For supplies equivalent to those of the E.D.F. and carrying the same guarantees, the scale of purchase prices would be the same as that of the charges made by E.D.F. at the same place, less an amount representing the estimated equivalent of the authority's costs of distribution.

E.D.F. considers that the application of these principles ought normally to lead to payment on a fair and reasonable basis for the supplies which it receives. All the remaining supplies not covered by this scheme would be regulated by agreements that would be freely reached. These would be subject in case of dispute to the decision of the Minister, where this is provided by the law, as it is, for instance, with regard to the fixing of the price of surplus power.

Supplementary and Auxiliary Supplies

The conditions and scales of charges for supplies to public departments, which were established at the outset of the distribution of electric power in France, and were revised in pursuance of special legislation in 1935, are at present, pending the drawing up of fresh conditions and scales of charges contemplated by the nationalization law, the principal basis of charges for high-voltage supplies. In principle, the price fixed per kW for supplementary and auxiliary supplies is twice the normal charge. This scale of charges has remained at the same level ever since it was introduced in 1935. Consequently it has lost all meaning.

Pending the drawing up of fresh scales of charges and new conditions, E.D.F. is making certain proposals to its consumers in respect of supplementary and auxiliary supplies. These proposals amount to a provisional contract embodying the tariff formulæ established for the present transitional period.

The tariff for supplementary supplies is a seasonal one, in which the fixed charge per kW varies according to the availability of water for the hydro-electric works. The fixed charge in winter is the highest; the lowest charges are in May and June, when water is abundant. The charges per kWh consumed vary according to the hours of use, and also according to districts and seasons.

The scale of charges for auxiliary supplies comprises a fixed annual charge per kW, the charge being of the order of fr. 1,200. This is in a certain sense an " insurance premium," which takes account of the risks assumed by E.D.F. of having to make good the result of casualties to the equipment of the independent producer. For the power consumed he is charged in the first place a fixed daily rate per kW effectively used for auxiliary purposes, with a minimum charge for six days. This charge varies according to the seasons, being for example six times as high in December as in June. There is in addition a proportionate charge per kWh.

We are indebted to the chief of the Service Commercial National of Electricité de France for this information.

Humidity Measurement

AMONG the recent publications of the American National Bureau of Standards is Circular 512, " Methods of Measuring Humidity and Testing Hygrometers," by Arnold Wexler and W. G. Brombacher. Essentially, it is a review of methods for the measurement of the water vapour content of air and other gases and for the production and control of atmospheres of known humidity for hygrometer testing and calibration and for general research purposes.

Among the hygrometric techniques discussed are psychrometry, mechanical hygrometry, dewpoint measurement, electric hygrometry, gravimetric hygrometry, thermal conductivity, index of refraction, pressure and volume measurements and dielectric constant. Descriptions are given of suitable equipment for establishing desired humidity over a wide range of temperature and in addition a list of 157 selected references pertaining to hygrometry is included.

The publication is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., price 15 cents.

Light for Seeing

By SAM BLACK, F.S.M.C., F.A.A.O.*

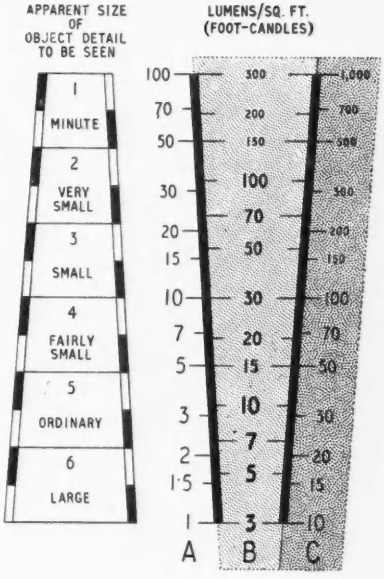
Why Good Vision Needs Good Illumination

SCIENTISTS have discovered recently that the speed of light is eleven miles a second faster than was previously thought. This fact is of little practical importance to those who generate electricity and supply it as a service to the community, but there are many aspects of light and lighting which are of very practical value and need to be discussed.

Certain significant changes have occurred during the last fifteen years or so which are of importance to all interested in illumination. More night work is being done in industry. This tendency has been accelerated by the urge to save fuel during daytime peak periods. The average age of workers in industry has risen sharply, due to the adult population of Great Britain growing older and because the Government has been actively encouraging elderly people to remain at work as long as possible in view of the shortage of manpower in most of the vital industries. These facts have a number of visual consequences which are worthy of consideration. With full employment in Britain there is opportunity for workers to choose their jobs and it is necessary to do everything possible to improve working conditions. Good lighting is a potent factor for raising morale in factory and workshop.

There is no special reason why anyone should dislike night work, apart from its disorganizing effect on normal family routine. Undoubtedly one factor which can produce a definite aversion to night work is inadequate or badly designed illumination in the workshop. In the past the main failing has been to provide adequate illumination levels. The human eye developed out of doors where illumination levels of 3,000 lumens/sq ft are common in sunshine; and yet some people think that indoor illuminations of 20 to 30 lm/sq ft can be harmful to the eyes!

The Lighting Service Bureau carried out a series of tests a few years ago in which the subject read a page of print while he was able to adjust the illumination to the most comfortable level, the latter being then recorded by the demonstrator. Results of these tests showed that most persons prefer strong light, about 125 lumens being the average reading. The question has been investigated extensively both in this country and in the United States while the familiar illumination chart issued by the Illuminating Engineering Society gives the *minimum* recommended values for different kinds of work under varying conditions of brightness and contrast. It is important to remember, however, that these recommendations can be exceeded with advantage, provided care is taken to avoid glare. In this chart for each category size (left) there are



I.E.S. artificial illumination chart

* Director, Information Bureau, Association of Optical Practitioners.

three scales of illumination (right) corresponding to three degrees of contrast. Scale A is for use with tasks where contrasts are good and scale B is appropriate where average conditions prevail, while scale C should be employed where contrast is poor. The range of illumination represented on the chart forms an approximate geometric series of values in accordance with the Lythgoe relationship. Each class of work is defined numerically in the Code.

The advent of the fluorescent lamp was a distinct advance because this means of lighting provided increased illumination at low running cost. The source is a large one and, therefore, the danger of glare is reduced considerably. The installation of fluorescent lighting is so simple that the fact is often overlooked that it requires careful planning, if it is to provide satisfactory seeing conditions. One can see in the pages of the lighting journals examples of excellent new installations; but in practice as one visits different factories many examples of bad lighting design are only too painfully obvious. One important principle in lighting is that the contrast between the illumination on the work and the general surrounding illumination should be kept as small as possible. It is *not* good to have the work brilliantly illuminated while the rest of the room is in semi-darkness. This fact is now generally appreciated and lighting installations are usually designed with this point well in mind.

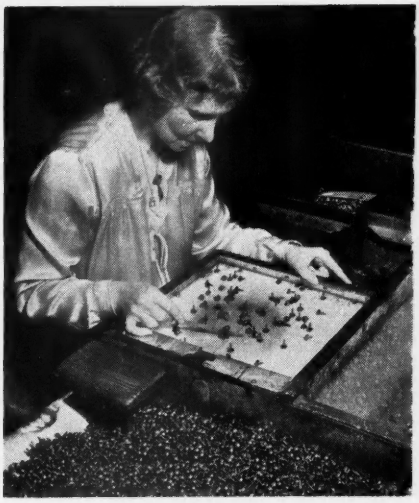
The machine operator needs adequate light properly directed

In most cases the lighting plan for office or workshop will include both local and general fittings, the whole providing the desired effect. Such planned illumination is often spoilt by employees turning off some of the local lights. It is economical of electricity to switch off lights on machines, or at desks, when the employee immediately concerned is absent, but it is false economy to do so because it means that other persons remaining in the vicinity have poor lighting. This is only one small example of the many ways in which good lighting design can be spoilt by extraneous factors.

For some very informative data on the effect of age on visual ability we are indebted to research work carried out by Mr. H. C. Weston, of the Medical Research Council. Mr. Weston discovered that there was a general tendency for visual performance to decline from quite an early age. In practice we do not notice this decline because the deterioration of our visual performance is very gradual. The effect of increasing the illumination is to improve performance, but Mr. Weston found that, although visual performance is more markedly improved by high illumination as age increases, it is not possible to compensate entirely for age by means of increased illumination. In other words, high illumination at 40 years of age does not permit as good visual performance as low illumination at 20. It is easy to understand from this finding why middle-aged workers are more likely to complain of poor lighting than younger ones.

Another point to be considered is that the proportion of persons requiring spectacles for their work rises steeply after 40 years of age; in fact 80 per cent of persons over 56 will need spectacles for close work. This is important because it has been proved that persons with defective vision derive more benefit from improved lighting than those with normal vision.

For these and other reasons it is clear



Left: **Typical example of good illumination in commercial offices.** *Right:* **Correct artificial lighting is essential to an inspection task of this kind**

that with an older working population there is a vital need for better lighting, if the older men and women are to be able to make their maximum contribution to industrial efficiency.

We all know how our mood is influenced by the weather. On a bright sunny day most people feel much more cheerful and energetic than when the sky is overcast. This psychological effect of light applies equally indoors. A bright well-lit workshop, or office, will promote a better output of work and will aid accuracy and quality of the work, while a dingy or gloomy room will make the workers sleepy and will militate against speedy or accurate work. This fact has been proved quantitatively in cases in which the lighting has been redesigned. The " before and after " effects are usually remarkable both as regards external appearance and in the results on the workers, who have felt fitter and happier and have produced better work.

This psychological factor deserves careful attention for it must not be forgotten that most of us spend a major part of our waking hours in office or workshop. Some remarkable results were achieved during the war in the " hush-hush " underground factories. The very thought of being underground is depressing, but this disadvantage was surmounted in many instances by clever lighting design. For instance, it is quite easy to create the effect of windows by means of concealed lamps and false windows while artificial fanlights do much to make the occupants forget that they are down in the bowels of the earth.

We have already mentioned some of the factors which aid easy and accurate seeing and the reasons why the problem is of national importance. The position can be summarized by saying that a person will see well if: (1) his eyesight is normal, or practically so, or if he wears spectacles when required; (2) his health is good, both physically and psychologically; (3) there is ample illumination, controlled so far as possible to avoid glare, undesirable reflections and other disturbing factors.

Of these three points, the lighting expert is only concerned directly with (3), but it is well to bear in mind the other considerations. To quote an example, the objections raised against the introduction of fluorescent lighting into offices were mainly psychological, leaving out of consideration the instances in which faulty installation may have been the cause. Seeing is done by our brains, our eyes being only the instruments which make vision possible. The act of vision is an extremely complex

mechanism, about which our knowledge is still far from complete. We do know, however, that visual memory plays a major part; in other words, our brain compares the appearance of objects with things we have seen before.

Another aspect of vision which is seldom appreciated is that it takes *time* to see. Light itself travels at the rate of 186,282 miles a second in air, so when you look at some object the reflected light reaches your eyes almost instantaneously. But before one can " see " the object, the light has to pass through the cornea, the aqueous humour, the crystalline lens, the vitreous humour, the layers of the retina and then act upon the visual purple in the rods and cones of the retina. Only then do the nerve impulses travel along the visual pathways to one's brain where they are interpreted as " something you are looking at." Although the act of seeing is so complicated it takes very little time, but it does need time. The speed of vision is slowed down considerably in poor illumination and vision is also hindered if the object looked at is moving. Up to a point, an individual's speed of vision can be quickened very appreciably by increasing illumination and this aids accuracy of judgment and has the apparent effect of slowing down movement and of making moving objects more easily visible. Thus more detail can be taken in at a glance, a fact of special importance in such work as conveyor belt inspection, sorting, etc., for which speed combined with accuracy is essential. Speed of vision is also a critical factor in safety in industry and on the road. Good lighting helps to prevent accidents by speeding up vision as well as by improving visibility.

Seldom does one find such a close relationship between two subjects as exists between the science of seeing and the practice of illumination. Vision without light is impossible; good illumination can be judged only by its effect on our eyes; a perfect partnership of function which demands an equally close relationship between those of us who study the visual needs of the community and the engineers who make artificial lighting possible.

Peruvian Market

THE prospects for British manufacturers of generating plant in the Peruvian market are dealt with by the First Secretary (Commercial) at Lima in a report issued by the Commercial Relations and Exports Department of the Board of Trade. This states that Peru has large potential hydro-electric resources estimated at 6,400,000 h.p. Little of this power has so far been exploited and much of it is in areas difficult of access. In 1947, the last year for which figures are available, total installed capacity amounted to 205,000 kW of which two-thirds was represented by hydro-electric plant and one-third by thermal plants. Lima accounted for 40 per cent of the total consumption. The total number of power plants was 592, of which over half were thermal plants. There were a few medium sized power plants supplying Lima and various mining and industrial enterprises and a large number of small installations, generally diesel electric, providing provincial towns or individual mines and farms with light and power.

A decree was recently published instructing the Department of Electricity in the Ministry of Fomento to prepare a national electrification plan which is to be ready by the end of 1952 and in which particular attention is to be paid to the dovetailing of the plans for electrification with the plans for irrigation which the Government is at present carrying out. Considerable sums of money are being devoted by the Government to irrigation and it is possible that in due course a loan from the International Bank for Reconstruction and Development may be forthcoming for this purpose. There are no signs at present, however, that the Government intends to devote large sums of money to electrification, and the national plan for electrification may well remain largely a paper affair. It is possible, however, that it may serve to arouse more interest in hydro-electric installations. Arrangements are being made for calls for tender issued by the Ministry of Fomento to be reported to the Board of Trade, but in addition, United Kingdom concerns interested would be well advised to arrange to be represented in Peru. Although there does not seem to be much large scale business on the horizon, there is some steady business to be done in the smaller types of electrical generators.

Ideal Home Exhibition

The *Daily Mail* Ideal Home Exhibition, 1952, will be held at Olympia, London, from 4th to 29th March.

PERSONAL and SOCIAL

News of Men and Women of the Industry

ON Monday the Minister of Fuel and Power announced the appointment of **Mr. J. S. Pickles**, B.Sc., M.I.E.E., J.P., as chairman of the Yorkshire Electricity Board in succession to Col. W. M. Lapper. Mr. Pickles has been chairman of the South West Scotland Electricity Board since its inception. He was actually appointed chairman-designate in August, 1947. Mr. Pickles is a Yorkshireman; he was born at Todmorden in 1898. He was educated at Manchester University and for ten years (from 1921 to 1931) was with the Yorkshire Electric Power Co. He was appointed electrical engineer by the Dumfries County Council in 1931 and held the position until he became chairman of the S.W. Scotland Electricity Board, when he also served as one of the Board-chairman members of the British Electricity Authority.

Mr. J. S. Pickles

Mr. Pickles was an active member of the former Incorporated Municipal Electrical Association; he was chairman of the Scottish Centre in 1939-40 and was elected president in 1946. He became a member of the I.E.E. Council in 1947 and was the author of two papers read before the Institution—"Rural Electrification" (1937) and "The Use of the Single-phase System" (1947).

Mr. J. C. Campbell, chief London representative of Keith Blackman, Ltd., retired last month after fifty years' service. He had represented the company both in Edinburgh and Glasgow and had been chief London representative for the past fourteen years. His successor is **Mr. D. J. Auld,** who has been with the company since 1914.

Mr. A. C. Day, A.C.G.I., B.Sc., formerly manager of the London office of Turnbull & Jones, Ltd., electrical and mechanical engineers, of New Zealand, has recently returned to New Zealand to take up the position of general manager of the company. Mr. Day has been with the company for a number of years and, before his appointment as London manager, he was chief engineer at the head office, Wellington. He succeeds the late Mr. C. J. Lenihan. **Mr. J. Maitland Jones** has been re-appointed as London office manager, and has already commenced his duties. Mr. Jones was for twenty-seven years London office manager before returning to head office just over four years ago.

Mr. W. Glass, M.I.Mech.E., joint managing director of Johnson & Phillips, Ltd., left this country in the liner *Oronsay* on 21st November for a tour of Australia, New Zealand, Canada and the United States. He intends to visit the company's branches, agents and associates in those countries, and expects to return to the United Kingdom in mid-March next.

Mr. J. N. Waite, M.I.E.E., F.Inst.F., is retiring this month from the position of Controller of the London Division of the British Electricity Authority. He informs us that he is leaving for Australia in the Orient liner *Orcades* on 19th December and is due to arrive in Sydney on 21st January. He will be advising the Electricity Commission of New South Wales on the power stations in the State which the Commission is taking over. His address will be: Electricity Commission of New South Wales, Kelvin House, 15, Castlereagh Street, Sydney, Australia.

Mr. J. N. Waite

Mr. Waite was educated at Tunstall and Leek Technical Schools and Sunderland Technical College, and commenced his career in the electricity supply industry in 1909 as a junior engineer with the North-Eastern Electric Supply Co., Ltd. From 1909 to 1913 he was seconded to Merz and McLellan, and in the latter year was appointed charge engineer with the North-Eastern E.S. Co., becoming control engineer in 1915, and testing and economy engineer in 1918. In 1921 he became chief assistant engineer with the Stoke-on-Trent electricity undertaking, and in 1927 took up the appointment of deputy city electrical engineer at Bradford. He was city electrical engineer and manager at Hull from 1929 to 1938, being then appointed district manager.

Central Electricity Board (S.E.E. and E. England), a position he held until nationalization, when he was appointed to his present position.

He is the author of numerous papers and articles on rating law, coal for steam raising, domestic cookers, power plant guarantees, public lighting, combustion and boiler-house efficiency, river water v. cooling towers, etc.

As we have already reported, **Mr. H. V. Pugh**, M.I.E.E., M.I.Mech.E., divisional controller, South Wales, is to succeed Mr. Waite as controller of the London Division of the B.E.A.

Mr. G. R. Lomax, the author of the article on "Overhead Line Erection," which appears on p. 1175 of this issue, is construction engineer to the Portsmouth Sub-Area of the Southern Electricity Board. After a period as system maintenance engineer with the Yorkshire Electric Power Co., he re-joined W. T. Glover & Co. in 1939, and before going to Portsmouth in 1946 was engineer in charge of contracts for that company in the London area with responsibility for work which included 22 kV cable installations upon the North Acton to Ruislip and Liverpool Street to Ongar extensions of the then L.P.T.B., and 132 kV gas filled cable installations for the C.E.B.

Mr. G. R. Lomax

Mr. F. J. Erroll, Conservative M.P. for Altrincham and Sale, who has contributed a regular Parliamentary commentary to our pages ("Industry and the House") since 1946, has been compelled by pressure of other business to hand the series over to another.

His successor is **Mr. Thomas F. Cook**, Labour Member for Dundee East. Mr. Cook, like Mr. Erroll, is an electrical man, being an associate member of the Society of Instrument Technology and a member of the Electrical Trades Union. He was first elected for Dundee East in 1945 and was later Parliamentary Private Secretary to Sir Stafford Cripps, then President of the Board of Trade, and his successor Mr. Harold Wilson. In this position he was a member of Board of Trade delegations to Russia, India, Pakistan and the United States. In the last Government Mr. Cook was Parliamentary Under-Secretary of State for the Colonies.

Mr. T. F. Cook, M.P.

To celebrate its golden jubilee the **Liverpool Electric Cable Co., Ltd.**, gave a dance at the Grafton Ballroom, Liverpool, on 13th November for 700 employees and their friends. Among those who attended the event were Mr. W. J. Terry (managing director), Mr. G. E. Jewell (director), Mr. F. W. Freeman, Mr. C. F. Williams, Mr. W. A. Sloane (branch manager) and Mrs. Sloane, Mr. J. T. Frost (works manager), Mr. B. Keywood (sales manager) and Mrs. Keywood, Mr. J. R. Cox (technical engineer) and Mrs. Cox, Mr. J. Shellard (accountant) and Mrs. Shellard, and Miss L. Brown (Manchester office). Music was provided by Joe Loss and his orchestra and Mrs. Wilf Hamer. The programme included several novelty items and spot prizes.

Mr. M. H. L. Lewis, M.A. (Oxon.), has been co-opted to the board of executive directors of Crompton Parkinson, Ltd., for a period of six months. Since April, 1950, he has been assistant to the works director (south). After military service from 1940 to 1946, he returned to Oxford to take his degree, and then in 1947 joined Crompton Parkinson, Ltd., at Chelmsford. Later Mr. Lewis served at Guiseley under the works director (north) and carried out special duties in all the company's works. Before taking up his present appointment he was production liaison officer at the Doncaster lamp works.

Mr. M. H. L. Lewis

The staff dinner given by **British Insulated Callender's Cables, Ltd.**, at the Grand Hotel, Harrogate, recently, was attended by upwards of 400 of the company's sales staff and the B.I.C. Construction Co. staff in the Midland, Northern and Scottish areas. The party was addressed by Sir Alexander Roger (chairman of B.I.C.C.) and a vote of thanks was accorded by Mr. A. S. Gee, M.B.E. (B.I.C.C., Lincoln sales, branch manager).

Successes of 159 students in the education scheme of British Insulated Callender's Cables, Ltd., were recognized at the annual presentation of awards held recently at the company's Prescot works. Presiding at the function was Mr. E. Bowyer (manager, production), who welcomed representatives of both local and county education authorities. A particular welcome was accorded the parents. The B.I.C.C. board of directors was

epresented by Mr. F. Waine (executive irector). Mr. N. G. Treloar (education fficer) presented the report for the year, after hich Mr. Waine distributed the awards. In brief address, Mr. Waine stressed the nportance of continued education, urging udents that once having embarked on a ourse of instruction, they should pursue it to ne end. A half-finished course was of little se to anyone.

Mr. F. C. R. Simms has been appointed les manager of the Overseas Engineering Co., td., as from 1st November. Mr. Simms has or many years been associated with the notor starting and control gear industry.

The annual ball of the **Electrical Industries Benevolent Association,** Northern Counties Area, was held in Newcastle on 28th November, when 300 members of the industry attended. The dance was preceded by a dinner, when Mr. C. R. King, president of the Electrical Industries Benevolent Association, proposed the toast of the Association, and in a short address he stressed the need for more individual annual members of the Association, and expressed his appreciation of the various committees throughout the country organizing similar functions to the Newcastle Ball. The guests were received by Mr. W. Dixon, chairman of the E.I.B.A. Northern Counties Area Committee, and Mrs. Dixon. The Organizing Committee for the ball were Messrs. F. C. Barford, R. H. Davison, and A. Parkin.

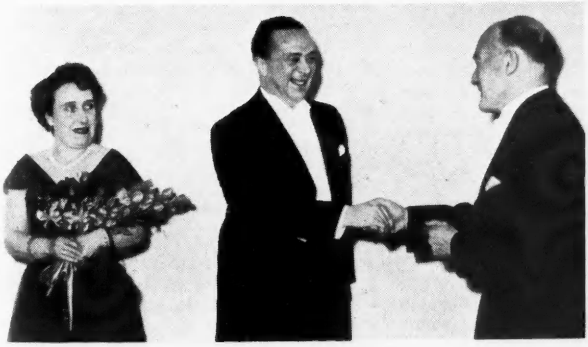
In our issue of 23rd November we referred to the exhibition held by the **Watliff Co., Ltd.,** at its Wimbledon works as part of its twenty-first birthday celebrations. These celebrations were continued on Thursday last week when the company entertained representatives of its customers and companies who supply it with its materials, to a dinner, dance and cabaret at the May Fair Hotel, London, about 300 people being present. The speeches were brief, and as is customary at birthday celebrations, were mainly congratulatory.

Mrs. Davison (wife of Mr. R. H. Davison) presenting a bouquet to Mrs. Dixon, who is accompanied by Mr. W. Dixon, at the E.I.B.A. annual ball at Newcastle-on-Tyne

Mr. Martin Hume (chairman of the company), who presided, said that messages of congratulation had been received from all parts of the world. Mr. W. E. Arnold (managing director), in proposing the toast of the guests, mentioned that although they were celebrating the twenty-first birthday of the formation of the limited company, the business had been in existence for thirty-one years. Mr. Harry May, clerk of the Merton and Morden Urban District Council, responded.

The toast of the founder directors was proposed by Mr. Maxwell H. Davies, who has been with the company since its commencement in 1920, and has been a director since 1943. He said that the success of the company was largely due to the excellent combination of its founder directors, Mr. J. J. Watson, Mr. A. O. Hinchliff and Mr. W. Martin Hume. Mr. Hinchliff and Mr. Hume made appropriate responses.

The sixth season of the **Ediswan Amateur Dramatic Society** opened recently with the presentation of Max Catto's "They Walk Alone." The five performances (which



Mr. G. H. Holding (centre) chairman of the Association of Electrical Machinery Trades, with Mrs. Holding, greeting Mr. E. H. Phillips at the recent annual dinner of the Association, a report of which was published in our last issue

included a matinee attended by an invited audience of elderly folk) drew several hundred to the canteen theatre at the Ponders End Works of the Edison Swan Electric Co., Ltd., including Mr. H. Butterworth (managing director), who was accompanied by Mrs. Butterworth, Mr. F. E. C. Miller (director), Mr. S. Hale (works manager) and Mrs. Hale.

The Student and Graduate Sections of the **Institutions of Civil, Electrical and Mechanical Engineers** held another successful annual joint dance at St. Pancras Town Hall, Euston Road, on Friday, 30th November. A pleasant evening was spent by 400 people dancing to the music of the Blue Rhythm Orchestra and there were several spot prizes. Mr. D. M. Watson, a member of the Council (Civil) was present with his wife.

Nearly 100 foremen and guests attended the annual dinner of the Foremen's Section of the **Telcon Staff Association** at Pyne's Restaurant, Lewisham, on Friday last. Mr. H. May (power cables) was in the chair and, in proposing the toast of the Telegraph Construction & Maintenance Co., Ltd., complimented the company on another satisfactory year. Mr. J. N. Dean (managing director of Telcon) replied. Other speakers included Messrs. F. Haywood (plastics), G. T. W. Whitehead (chief engineer, Johnson & Phillips, Ltd.), H. F. Wilson (technical manager, Telcon) and W. R. Bell (secretary of the Section).

On 23rd November a dinner party was held to celebrate **Mr. J. H. W. Morgan's** silver jubilee as chief accountant of the Edison Swan Electric Co., Ltd. Mr. H. Butterworth, managing director, with Messrs. Bunting, Miller and Ridgeway, directors, attended, together with Miss Miller, publicity manager, and Mr. Adey, manager of the Birmingham district office.

Earl de la Warr has resigned his directorship of the main board of the Brush Electrical Engineering Co., Ltd., on his appointment as Postmaster-General. **Mr. I. T. Morrow,** late of Robson, Morrow & Co., who has been financial adviser to the Brush ABOE group, has been appointed to the board of the Brush Electrical Engineering Co., Ltd.

OBITUARY

Mr. John A. Ross, joint managing director of Ransomes & Marles Bearing Co., Ltd., died on 26th November. Mr. Ross joined the company as secretary in 1924, became joint general manager in 1936, a director in 1937, and joint managing director in 1941.

Mr. Adolph Vines, M.A. (Cantab.), M.I.E.E., a founder and chairman of Evershead & Vignoles, Ltd., died on Saturday last in his eighty-fifth year. He was appointed works manager of the company when it was formed in 1895 and from 1909 to 1940 was a joint managing director. On his retirement in 1940 he retained his seat on the board and i August 1940 was elected chairman, a positio he held until his death. Mr. Vines was member of the Management Board an Conference Committee of the Engineering an Allied Employers' National Federation, a pos he relinquished only three weeks before hi death. Among his many other activities, h had been a vice-president of the Britis Engineers' Association and a vice-chairman o the British Scientific Instrument Researc Association.

Mr. J. H. Dinwoodie, manager of th Edinburgh branch of British Insulate Callender's Cables, Ltd., died on 28t November at the age of fifty. He joined th former Callender's Cable & Construction Co. Ltd., in 1916 and served for many years in it Glasgow office where he specialized in mining electrification work.

Mr. George Pollard Dennis, chairman o G. P. Dennis, Ltd., died on 28th November, a his home in Heswall. He was connected with the electrical industry for nearly fifty years, and before starting in business on his own account he was head lecturer in electrical engineering at Liverpool Technical College. In 1927, he was president of the Electrical Wholesalers' Federation and two years later was president of the Federation's Lancashire and Yorkshire Section.

WILLS

Mr. E. L. Barnes, A.M.I.Mech.E., late deputy chief engineer at Little Barford generating station, Eastern Division, B.E.A., who died on 10th May, left £4,492 (£4,351 net).

Mr. E. Statham, A.S.A.A., F.R.Econ.S., secretary-accountant of the North Staffordshire Sub-Area of the Midlands Electricity Board, who died on 15th June last, left £15,528 gross (£15,442 net).

Mr. C. F. G. Pendle, of Salisbury, late area manager for the Southern Electricity Board, who died on 3rd June, left £724 gross (£693 net).

Mr. F. W. Maynard, mining representative for A. Reyrolle & Co., Ltd., in the Midlands, who died on 23rd May last, left £1,813 gross (£1,668 net).

Mr. R. Mitchell, station superintendent at St. Swithins power station, Lincoln, who died on 11th May last, intestate, left £2,126 gross (£2,039 net).

Mr. A. A. Byne, a director of L. E. S. Distributors, Ltd., who died on 20th April last, left £45,755 gross (£45,141 net).

Mr. W. Sutcliffe, M.I.E.E., A.M.Inst.C.E., late of the English Electric Co., Ltd., who died on 5th July last, left personal estate in England and Scotland valued at £6,478.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electric Water Heating a Luxury?

THE letter from Mr. Vigers in your issue of 16th November expresses an opinion which is becoming so fashionable that it threatens not only development within the industry, but the attitude of mind of newcomers into our ranks. It is therefore doubly to be deplored.

My domestic boiler installed two years ago in a modern insulated hot water system, works at an efficiency of 18 per cent. The figures quoted by Mr. Vigers are generous to say the least and disregard such vital considerations as transport, labour and fuel utilization.

The subject is worthy of many pages of discussion in your columns but the old adage "the best is cheapest" still serves as a guide to real worth. Marching backwards twenty years is not going to get this country ahead.

Eastbourne. E. C. CLAYDON.

Boards and Districts

ACCEPTANCE by Mr. Walsh in his article in your issue of 30th November that distribution and generation should be separate organizations requires further examination. The division of the country into areas—Yes!

From examination of the map and the data for each Area it is clear that considerable forethought was given, although anomalies do exist, but as the Divisions are contiguous with the Area Board boundaries, how then can a completely duplicated administration be justified?

It is obvious that some national co-ordinating policy for generation is vital, and this was in fact achieved before vesting, but the administration as opposed to the specialized engineering needs could surely have been dealt with by one and the same organization. The secretarial, accounting, purchasing and labour relations, establishment and constructional sections—these surely do not need to be duplicated at a level where the salaries, and consequently the costs, are high. Would it not have been feasible to place under the chairman of each Area Board two deputy chairmen—one for distribution and one for generation. Writing as one with experience of a very large undertaking which formerly managed several generating stations, I think there would appear to be no practical difficulty.

There is an artificial split in our former employees, who notwithstanding are still employed under the same national agreements, and the work relative to generation has been split off to help form a new high level administrative unit which slavishly models itself on the more influential Area Board set-up. The same officers exist in both whose duties could readily be performed by one in most cases. Within the labour relations machinery there is of necessity common ground at District Council level for discussions of common problems. Presumably it would have meant displacement of former officers—particularly of the C.E.B.—but immense saving could have been achieved by a more realistic organization at the outset. It is interesting that in the later Gas Act the same artificial split was not attempted.

Turning to the problem of the position of the Sub-Areas and the Districts, this is one that can only be solved by having greater regard to local circumstances. In the highly integrated urban groups there would seem to be little justification for the District except as an engineering and labour depot, but, as your correspondent suggests, there appears to have been an artificial tidiness imposed throughout the entire organization. When dealing with scattered and separate rural communities the District with a local manager is the obvious type of operational unit and the function and usefulness of the Sub-Area is greatly minimized, but in large towns where all roads lead to the centre and no logical separation into Districts is possible, the superimposition of a *pro forma* organization is alien to the needs of the neighbourhood, and a Sub-Area operating direct would seem to be more effective. The creation of Districts in such cases as these has

certainly caused considerable duplication of staffs and greatly increased administration costs.

The tendency of the Area Boards to depart from their originally intended function of " policy makers " and become more and more departmentalized is apparently inevitable. Therefore a greater degree of flexibility in administration would contribute to the solution of a problem for which there is no one answer. The writer is convinced from personal experience, however, that if more independent executive control were vested in Sub-Areas where the circumstances justified it, and in District managers where geographically this was warranted, a reasonable compromise might be arrived at and a mixed organization which was more suited to varying local needs within the Area result.

Birmingham. H. V. HONICK, A.C.I.S.

Grain Drying in Scotland

THE account given in the *Electrical Review* of 30th November of a grain drying plant in Aberdeenshire appears to refer to an " in-bin " installation and is, therefore, the more interesting since the northern half of Scotland has been regarded by some as affording doubtful conditions for operating this type of plant. The success obtained in this particular installation will, therefore, encourage other farmers in Scotland to use what can be an excellent system of grain drying when storage is required.

I regret, however, that your contributor has given any suggestion that there may be some restriction of the scope of applying this system electrically on the grounds of cost. While, of course, the meticulous control of air temperature which is possible with electrical heating makes it particularly suitable for the drying not only of barley for germination but of wheat for milling, the all-electric in-bin system is widely applied for drying all types of grain crops. Indeed, this method is hardly practicable on any other than an all-electric basis.

I am, too, somewhat puzzled at the suggestion that other, presumably in-bin, plants have been designed with too much focus on heating and it is indeed difficult to see in what way the plant described differs materially from those widely used in different parts of the country. Indeed, the airflow provided in relation to the 36 kW of heating is not substantially different from general design. Failing, therefore, some more detailed information, it would not appear that this installation differs materially from scores which have been in use for several seasons, but its successful use in the North of Scotland is most encouraging.

I would also suggest that the total fan loading is probably 12 h.p. and not 24 h.p. as might be read into the wording. At the same time there must be a misprint in giving the performance as 1 per cent per *hour* reduction in moisture content; the expected reduction would be of the order of ½ to 1 per cent per *day*.

S.W.1. C. A. CAMERON BROWN,
Agricultural Electrification Adviser.
British Electricity Authority.

[As Mr. Cameron Brown suggests, the total fan loading is 12.6 h.p., two 6.3 h.p. motors each driving a pair of fans. The reduction in moisture content is 1 per cent per day.—Editors, *Electrical Review*.]

News from Ireland

From Our Dublin Correspondent

ANNOUNCING an increase in the electricity ration in Ireland to 100 per cent (i.e., up to the amount used last year) the Electricity Supply Board has nevertheless stressed the necessity for continued economy in the use of electrical appliances. The ban on new connections of space heating (other than night storage), water heating, cooking and process heating equipment remains in force for the time being.

The establishment of the " Gaeltacht Department " is considered as a sign of the Government's intention to extend the E.S.B. system to the west of Ireland at an early date. Large tracts of this area are at present remote from electricity services. With the completion of new transforming stations at Galway the city will become the distributing centre for all the west. Two 38 kV lines feed it from the Shannon power station at Ardnacrusha and a 110 kV line will soon aid the direct supply to the city.

Last year the Board's engineers commenced a hydrometric survey of the River Owenglin outside Clifden to ascertain if the flow and volume of the water would be sufficient to operate a plant. A year more will elapse before this survey can be completed. Wind power survey stations have also been erected at a number of points in the west, namely on the Corraun peninsula, Slievemore (Achill Island), Tully mountain, Errisbeg and Inishmore (Arran Islands). A few have been erected along the Donegal coast and it is likely that Kerry coastal areas will also be chosen as the sites of a further number.

PARLIAMENTARY NEWS

From Our Special Reporter

LAST week in the House of Commons Major Anstruther-Gray asked the Minister of Fuel and Power whether he could see his way to increasing the capital expenditure allocation for electricity in order to allow urgent schemes of rural electrification to be proceeded with.

Mr. Joynson-Hicks, Parliamentary Secretary, said that the Government was at present reviewing the entire field of national investment and the Minister was therefore not in a position to make a statement about any part of it.

Home Service Transmitters

Mr. Hayman asked the Assistant Postmaster-General to what extent the proposed low-powered medium wave transmitter for improving the reception of the Home Service in South-east England was being proceeded with.

Mr. Gammans said he understood from the B.B.C. that temporary transmitters were already working at Brighton, Hastings and Ramsgate. The B.B.C. hoped to start transmissions from Folkestone early in the New Year.

Television in Cinemas

Mr. Reeves asked the Assistant Postmaster-General whether he would assure the House that no licence to receive television pictures at public cinemas would be granted until the House had had an opportunity of considering the terms under which such licence was granted.

Mr. Gammans said that no licences for showing television programmes to paying audiences at public cinemas would be granted until the Government had informed the House of its views on the public showing of television.

Meters Bill

On 29th November the Electricity Supply (Meters) Bill was introduced and read a first time. It extends for a further period of five years the period at the expiration of which Section 3 of the Electricity Supply (Meters) Act, 1936, is to cease to apply to any electricity meters. This section permits the retention in use of meters installed before the "appointed day" (1st July, 1938). The period is extended by the Bill to 20 years from the appointed day.

Yorkshire Board Chairmanship

Mr. Geoffrey Lloyd, Minister of Fuel and Power, announced in the House on Monday last that he had appointed Mr. J. S. Pickles, chairman of the South West Scotland Electricity Board, to succeed Col. W. M. Lapper as chairman of the Yorkshire Electricity Board; Mr. Pickles would take up his appointment as from 4th December. He had accepted the resignation of Mr. F. Newey from the position of deputy-chairman of the Yorkshire Board as from 1st December. He hoped to announce the name of Mr. Newey's successor shortly.

Mr. Lloyd said that he did not propose to make any change in the part-time members of the Board as a result of the recent case. He was satisfied that the part-time members did not know that unauthorized expenditure was taking place and were entitled to assume that the responsible officers of the Board would obtain the necessary licences and consents from the Government Departments concerned.

Mr. Marlowe asked the Minister whether in connection with the incorrect answer regarding expenditure by the Yorkshire Board given to the House by his predecessor he had obtained information from the Board.

Mr. Lloyd said that in the time available information had to be obtained and checked by telephone. When he saw the part-time members of the Board last week they brought to his notice information which showed that the officer of the Ministry who was instructed to obtain and check the information from the Board may have been aware of the inaccuracy of the answer. He had instituted immediate investigations which were not yet complete. When they were he would report the result to the House.

Expenditure at Wherstead

Mr. J. H. Hare asked the Minister what expenditure had been authorized for repairs, adaptations, additions and decorations to Wherstead House, near Ipswich, since the Eastern Electricity Board had acquired it.

Mr. Lloyd said that his predecessors issued five authorizations under Defence Regulation 56A for the rehabilitation and extension of Wherstead, headquarters of the Eastern Board, amounting in all to £111,500.

Mr. Hare asked if the Minister was satisfied that this huge sum spent on property which cost £12,000 was justified and if he would look into it.

Mr. Lloyd said that he was quite prepared to examine the matter but was not aware how much of the sum had already been spent.

Power Plant Expansion

Replying to Mr. Nabarro, Mr. Geoffrey Lloyd said that it was planned for the British

Electricity Authority to commission 1,100 MW of plant this year and 1,250 MW in 1952. With allowance for plant going out of service, this should have given a net addition this year of over 1,000 MW and of about 1,100 MW in 1952. Shortages of raw materials and the needs of defence might prevent these totals being reached but he hoped that at least 1,000 MW would be commissioned this year.

B.E.A. power stations consumed 31½ million tons of coal in 1950 and might consume about 35 million tons in 1951 and 38 million tons in 1952, but the increase in consumption would be less in proportion than the increased supply of electricity produced. This was because the new stations were used for 24 hours a day and made it possible to restrict to shorter periods the use of much less efficient older stations. The programmes of development of the National Coal Board and the B.E.A. were settled in consultation with him and there was full opportunity to see that as far as possible there was a proper balance.

Oil Firing in Power Stations

Miss Ward asked the Minister of Fuel and Power whether he had considered the possibility of firing new generating plant by oil instead of coal.

Mr. Lloyd said he was already studying this matter. The use of oil, however, arose more helpfully with regard to existing power stations.

Mr. Hobson asked if the Minister was aware that the policy of firing boilers by oil was very expensive and uneconomic and that it had a deleterious effect on the men who had to work in the power stations, particularly with the cleaning of switches.

Mr. Lloyd said that in a very acute coal situation it might have to be considered.

Coal Stocks

Mr. Lloyd told Lt.-Col. Lipton that stocks of coal at power stations in November amounted to 5,261,000 tons against 3,988,000 tons in November, 1950, and 4,476,000 tons in November, 1949.

Factory Generating Plant

Mr. Nabarro asked the Minister what was the policy of the Government regarding the installation of generating equipment in factories and particularly auto diesel sets, back pressure turbines and reciprocating engines; and whether he was satisfied that all contractual restrictions and financial discouragements had now been removed by the British Electricity Authority in respect of independent electricity generation.

Mr. Lloyd said that this was a matter he was looking into and he was not at present in a position to make a statement.

Steam Pressure Boilers

Mr. Hobson asked the Minister at what steam pressure and superheat temperature boilers were now being supplied to the British Electricity Authority.

Mr. Lloyd said he would refer Mr. Hobson to the third report of the B.E.A.

Mr. Hobson asked if the Minister was aware that the information in the report was not quite correct and that there was ample evidence that Statutory Order 2596 of 1947 had not been complied with.

Mr. Lloyd said he would like notice of the question.

Old N'Ions Annual Reunion

THE annual dinner and reunion of the Old N'Ions (Northampton Engineering College Past Students' Association) was held on Friday last at the Connaught Rooms, when the president, Colonel John Reading, M.B.E., B.Sc. (Eng.), M.I.E.E., Assistant Engineer-in-Chief of the Post Office, was in the chair. The guests included Mr. Charles I. Orr-Ewing, O.B.E., M.A. (Oxon.), M.I.E.E., M.P., and Dr. W. G. Radley, C.B.E., Ph.D. (Eng.), M.I.E.E., Engineer-in-Chief of the Post Office.

Mr. Orr-Ewing, a former Governor of the College, referred to the high place it now occupied in the revised scheme of technological education in this country whilst Dr. Radley congratulated the College on the training it afforded the engineering staff in the Post Office. In his reply to the toast of the College proposed by Mr. F. L. Best, M.I.E.E., Dr. J. E. Richardson, B.Eng., M.I.E.E., A.M.I. Mech.E., the Principal of the College, thanked the past students for their co-operation and support.

A presentation was made to Mr. J. Mortimer Hawkins, a vice-chairman and for four years previously hon. secretary and treasurer, as an acknowledgment of his enthusiasm in building up the Association since the war as well as of his success in raising a war memorial fund of over £3,000. The organization of the reunion was in the hands of the committee to whom a past-president, Mr. A. N. D. Kerr, A.M.I.E.E., acts as hon. secretary. He will be glad to hear from members in the industry who may have lost touch.

The first award for a travelling bursary to be made from the funds collected by the members of the Association as a 1939-45 war memorial was in favour of Mr. W. E. Murphy, who has just completed his training at Northampton Engineering College. As a consequence, Mr. Murphy travelled in Austria, Switzerland, Italy, Germany and France, working and observing the technical procedures and customs of the people concerned.

Industry and the House

Government and the Economic Situation

By T. F. COOK, M.P.

THE new Parliament is slowly settling down and there are surprisingly few new faces around the building, which of course makes the job of the new Speaker, the policemen and the officials much easier. It would, of course, be out of keeping if the Mother of Parliaments wasn't just a little sad at the loss of two sons and one daughter in David Kirkwood, Col. Clifton Brown and Lady Megan Lloyd George.

It was obvious right from the start that the House was uneasy on the score of the large number of members of the House of Lords in the Cabinet. The Commons is a jealous mistress and insists that her right to question policy-making Ministers should remain inviolate. What can already be seen is that the Prime Minister might have a larger number of questions to answer than is normal and since he answers from No. 45 every day it could become very difficult for him, more particularly since he has also burdened himself with the very heavy work of the Defence Ministry, a Ministry which in the present situation demands full and undivided concentration.

There is in this House a general feeling that the new Ministers will have to be given time to settle in to their Departments but there will of course be extensive "quotes" from previous speeches made by them in the last Parliament.

Supplies and Services

This was clearly brought out in the debate on the motion to extend the Supplies and Services Acts for another year, and the House appreciated the fresh candour of Sir David Maxwell Fyfe in his handling of the debate. Industry and the country generally had better get it quite clearly into their minds that this Act is with us for a long time to come. There may be some slight relaxations, but they will be so slight as to be almost insignificant.

The most eagerly awaited statement was, of course, that of the Chancellor of the Exchequer. Mr. Butler, in an objective analysis of the situation, went out of his way to make it clear to the House that he did not find "skeletons hanging like candelabra in every office in Whitehall," as Captain Crookshank had stated. The gravity of the economic situation of the country was brought sharply home to the members during a long statement. Mr. Butler paid tribute to Sir Stafford Cripps and Mr. Hugh Gaitskell for their realistic handling of the difficulties the country has had to face since 1945.

The Economic Problem

The Chancellor put the problem under three heads. First, there was the pressure of the balance of payments as the result of the staggering increase in external payments which are running at £600 million more than in 1950. He argued that when new pressure of this kind comes on the balance of payments it is vital to have a highly flexible internal economy in order to adjust it.

He went on to say that our economy was not showing this flexibility. There were three main reasons for this. First our basic industries of coal, steel and transport were not producing enough to provide the foundation for an economy adequate to our requirements for home, export and defence. Mr. Butler said we needed more coal than we were producing on present trends; we needed 1½ million tons of finished steel more than we had been able to produce or import in 1951 to meet home and essential export needs; then the transport system was working under conditions of the greatest strain.

Secondly, the impact of the defence programme was on just those industries from which any really substantial increase in exports must come. Thirdly, there was the general overloading of the internal economy which prevented resources being switched, as they must be, to the places where they were most needed. Finally, the home demand for engineering products was far in excess of possible supply.

The significance of the last two statements rather escaped the notice of the House. But the content and portent is obvious: manpower and raw materials must be taken away from non-essential industries. From this the questions arise: what is a non-essential industry and does the Government intend to reintroduce the Essential Work Order, authorizing the compulsory transfer of workers?

We have as yet had no clear statement of the Government's intentions, although early indications (including the raising of the bank rate) are that it would like to attempt some deflation. The danger here is that deflation is like a snowball and the effects are widespread. Industry in general and the electrical industry in particular will have to study the developing situation very closely.

Sir Arthur Salter, Minister of Economic Affairs, rather lent emphasis to this when he stated in defending the increase in the interest rate to local authorities under the Public Works Loans Bill that there must be economies in local as well as national spending. Clearly if local authorities are to proceed with the building of schools, houses, etc., the cost will be considerably greater and they will be compelled either to pay the increase and go on with their present plans or cut them considerably, with obvious results. The one bright feature is that the North of Scotland Hydro-Electric Board is being given powers for further substantial borrowing.

The questions on the recent case of the Yorkshire Electricity Board were the subject of some excitement in the House and they came so thick and heavy that the Prime Minister himself saw fit to intervene to intimate that the matter had been fully investigated and to point out that many aspects of this case had been brought into the full glare of public light. Indeed, one felt that what he meant was that it had had deep X-ray treatment and that the matter should now rest there.

The Minister of Fuel and Power defended his predecessor in this matter. He said that he proposed to terminate the appointment of Colonel Lapper as chairman of the Y.E.B. and that the deputy chairman, Mr. Newey, had tendered his resignation. But at the same time Mr. Newey was carrying on in his position until the Minister had had time to consider such new appointments as he considered necessary. One member was heard to say "There but for the grace of God goes . . ." but probably the best comment is "Judge not lest ye be judged."

Specialists and Sub-Contractors

REPRESENTATIVES of the twenty-one member organizations (including the Electrical Contractors' Association) and their guests met at the annual luncheon of the Federation of Associations of Specialists and Sub-Contractors (F.A.S.S.) at Grosvenor House, London, W.1, on 29th November. The chair was taken by the president, Mr. D. H. Green, O.B.E., B.Sc. (Eng.), M.I.C.E., who proposed the health of "H.M. Government." Mr. David Eccles, Minister of Works, replied.

Mr. Green spoke of the good relationship which had always existed between the Federation and the Ministry of Works. The interests represented in F.A.S.S. were very diverse, which made it easier for the Minister to consult and advise many sections of the building and allied industry. The speaker impressed upon the Minister the desirability of reducing controls which impeded enterprise and took up valuable time; of assisting producers of materials to increase their output; and of giving members of the Federation guidance as to where their efforts could most profitably be employed. He also appealed to the Ministry to help secure better financial terms for the building industry.

In the course of his reply, Mr. Eccles said that the Government and the building industry had to prove the claim that free enterprise was best. The Government had to trust industry to produce results. They should not neglect the labour side; by good management they could give the operators a better deal than a nationalized industry could. The Government wanted to hear from them what controls could be relaxed. Allocation of scarce materials (particularly steel) was essential; in that allocation he would speak up for the building industry. There were other materials which it was in the power of producers to increase by a combined operation with the Government.

There must be credit restrictions at present but there would be expansion where expansion was really necessary. Mr. Eccles said that full employment did not mean maintaining men in their present jobs for ever. There must be greater fluidity in labour if rearmament was to be successfully accomplished.

Major A. C. Brooks, chairman of the Council of the Federation, proposed "The Guests" and Mr. R. E. Enthoven, vice-president of the Royal Institute of British Architects, responded.

The Statistical Approach

Solution of Electricity Supply Problems

AT a meeting of the Institution of Electrical Engineers' Supply Section on 28th November, Mr. R. B. Rawson drew attention to the help obtainable from the use of statistical technique in solving certain electricity supply problems. After outlining the simpler methods in use with the aid of graphs and numerical examples, the author discussed various applications, such as estimation of plant reliability, relay settings, and loading and weather as affecting maximum demands.

He also showed how probability questions affected comparisons between single- and three-phase systems and suggested that the rigid statutory limits of $\pm$ 6 per cent for voltage drop in distribution might result in a higher standard than was necessary to the majority of consumers; similar considerations, he said, applied to meter testing. The effect of tariff changes on revenue, the valuable aid secured from consumer sampling and the economics of lamp replacement in street lighting schemes were among the other aspects considered.

The author quoted the recent description by Mr. M. G. Kendall of the statistical technique as " the principal instrument yet devised by man for bringing within his grasp the complexities of nature and the relations existing between different phenomena."

DISCUSSION

In opening the discussion, Mr. D. P. Sayers (B.E.A.) said that the B.E.A. had applied multiple regression analysis to the study of the effect of weather on demand, and had found that at about 45 deg F, which was the most sensitive region, a drop of 1 deg F increased the national load by 80 MW, a fall of 5 deg meaning an increased load of 400 MW. The difference between a clear day and one with 10/10th cloud might be about 400 MW, other things being equal, while a windy day might increase the load by 200 MW. The normal development of demand could be masked by extreme weather variations and to evaluate the true increase the actual demand experience was reduced to a standard weather basis. The apparent increase in demand between October, 1950, and October, 1951, was 7 per cent, as compared with 13 per cent during the preceding twelve months, but on a standard weather basis the demand was found to have increased by 10 per cent in each year.

An examination of the amount by which areas were out of balance in the matter of generating plant during the years 1943 to 1949 indicated the necessity for an interconnection of capacity of the order of 400 MW between the north and south of the country, and this was largely the basis on which the " super-grid " had been planned.

Professor G. A. Barnard (Imperial College) said that statistical methods were valuable where they were relevant, but it was possible to " oversell " the idea, which might result in inappropriate use.

Mr. G. R. Peterson (B.E.A.) dealt with the application of statistics to the problems of operating generating stations, and said that one difficulty was that the number was very small, there being only about 300 stations in the country with some 1,000 generating sets.

Mr. G. H. Daniel (Ministry of Fuel and Power), on the basis of a multiple correlation analysis, estimated the increase in the consumption of electricity in recent years at 9 per cent per annum, but said it could not be assumed that that rate of increase would continue. A straightforward extrapolation of a trend derived by statistical methods was not a reliable basis for forecasting. The consumption of all forms of fuel in this country had been increasing at the rate of about 3 per cent per annum and was unlikely to exceed that rate. A continued increase of 9 per cent per annum for electricity would soon impinge on the curve of total fuel consumption. Statistical analysis must therefore be supplemented by a detailed economic study of the changes in the national income and their relation to total fuel consumption and a study of the

possibilities of replacing each type of fuel by electricity.

Mr. P. Schiller (B.E.A.), referring to methods of sampling, emphasized their help in the preparation of standard tariffs and said that the accuracy of the sample was determined not by the percentage but by the absolute size. When a system supplied more than 400 to 500 consumers the random variations between consumers no longer played a part in the formation of variations of demand, which must be attributed to some cause affecting all or most consumers in a similar way, such as the weather.

Mr. F. H. Dennis (South Western Electricity Board) said it seemed strange that the industry had been able to get along at all without knowing what effect a price change would have on consumption. The explanation was probably that the size of the market had been continually increasing, but that might not always be so and a more detailed knowledge might soon be needed of the effects of tariff changes.

Mr. P. H. Margen (Kennedy and Donkin) dealt by means of diagrams with the determination of reserve generating plant capacity and transmission line capacity by probability methods.

Unsuspected Variables

Mr. D. J. Bolton (B.E.A.) referred to the danger of unsuspected variables cropping up and suggested that the reason for the erratic results found when the relationship between the load factor and the coincidence factor was plotted arose from the fact that the load factor contained two quite different variables, the load factor during the use period and the ratio of the use period to the total period, of which only the former was related to the coincidence factor.

Mr. E. Mead (Metropolitan-Vickers), dealing with what the author had said about meters, in which the merits of a meter were based on five factors, of which one was appearance and another accuracy, maintained that the appearance of the meter counted for nothing whatever and said that, while the B.S. specification considered a meter satisfactory if it was accurate within $\pm$ 2½ per cent, meter technicians demanded an accuracy of about $\pm$ 1 per cent. Appearance and accuracy, in his view, were costing the consumers of this country a great deal of money.

Statistica methods had been adopted o get an idea of the " outages " of generati g plant, and as a result he believed that it had been suggested to some large man - facturers that they should set aside certa n machinery and facilities for repairs. H e understood that the manufacturers ha d not agreed, since they might find then - selves with idle machinery which could b e better employed in making new equipmen .

The author replied to the discussion.

Manufacturers and Wholesalers

Electrical Contractors Entertained

THE annual dinner of the Bedfordshire and Hertfordshire Branch of the Electrical Contractors' Association and the manufacturers and electrical wholesalers in the area, was held on 14th November, the hosts this year being the manufacturers and the electrical wholesalers. The function was attended by 120 people.

The chairman, Mr. W. Crisp, director of Young & Wildsmith, Ltd., and a member of the Council of the Electrical Wholesalers' Federation, proposed the health of the guests (the Beds. & Herts. Branch of the E.C.A.) and, in the course of his speech, said that this annual meeting was perhaps one of the best methods of getting together and endeavouring to understand their many problems. The manufacturers, in his opinion, could not operate satisfactorily without the wholesalers and the wholesalers certainly could not function efficiently without the electrical contractors. He referred to the untiring efforts of Mr. Plummer, vice-president of the E.C.A. and chairman of the Beds. & Herts. Branch, in the interest of his Association.

Mr. Plummer, in reply, said that the friendly co-operation between contractors, and between contractors and suppliers had also been of a very high standard in the area, and this annual event contributed in no small way to the continuance of that spirit. While not of the opinion that the structure of the industry was the best that could be achieved, he thought all those in the industry in the area operated the existing arrangements as well as they possibly could be operated.

I.E.E. Lectures for Schoolchildren

A CHRISTMAS lecture has been arranged by the Institution of Electrical Engineers for older schoolchildren. The subject of the lecture will be " Electricity in Civil Aviation," and it will be delivered by Captain P. Bressey, a senior pilot of the British European Airways Corporation, on the afternoons of 3rd and 4th January at the Institution, Savoy Place, London, W.C.2.

Subway Cars for Canada

Large Order for British Company

LAST week we briefly reported that the Gloucester Railway Carriage & Wagon Co., Ltd., had been awarded a contract worth nearly $8 million by the Toronto Transportation Commission. It covers 104 rapid transit cars for the Yonge Street Subway and was given to the British concern after the Commission's engineers had visited several other countries to study rapid transit operations and car-building. The local representative of the main contractors is Bepco (Canada), Ltd.

Each of the cars will be about 57ft long and 10ft wide, seating 62 passengers and having three sliding doors on each side; the weight, empty, will be over 27 tons.

Two cars will be semi-permanently attached to form a two-car unit for running during off-peak hours. As traffic increases, additional two-car units will be added; a maximum of eight cars can be accommodated at the 500ft platforms provided at the stations.

The superstructure comprising the car underframe and body will be of all-steel integral design in accordance with modern conceptions. The floor will be of rubber laid on a cork foundation and other steps will be taken to reduce noise.

There will be one driver's cab per car body, at the coupling end of a two-car unit. In effect, this provides a two-car unit approximately 114ft long with a cab at each end. The operator can control a train of 2–8 cars from the driving cab whilst the doors can be controlled from any cab not used for operating the train.

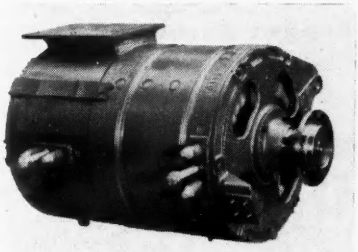
The bogies will be designed and manufactured by the Gloucester company and arranged to mount two propeller shaft driving motors per bogie with hypoid gear axle units, manufactured by David Brown & Sons, Ltd. The motors will be frame mounted and, therefore, spring borne and not axle hung as has hitherto been conventional practice. Roller bearings and solid steel wheels will be used. The suspension system will be by laminated springs and triple coil helical springs with spring loaded friction pads to provide suitable damping.

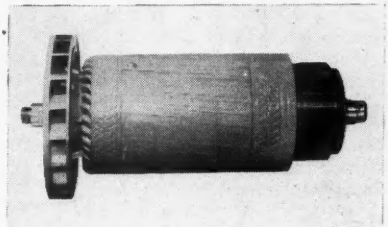
Each truck will have a shoe on each side for current collection from the top surface of the third rail. There will also be pneumatic trip-cock devices for automatic emergency stops, should the train be operated beyond a red signal light.

The two cars of any one unit will be held together by a bar coupling, mounting draft gear with electrical connections made by multi-conductor cables. Coupling for multiple unit working will be by means of fully automatic electro-pneumatic couplers, manufactured by G. D. Peters, Ltd., fitted at the leading end of each car, with switch control from within the cab giving coupler lock and change-over of electrical and air controls for through working.

The traction motors, which are to be supplied by Crompton Parkinson, Ltd., of Chelmsford, are of the series-wound type, operating in pairs permanently in series across the 600 V supply. Each car will have four 68 h.p. motors designed to have their

Type of C.P. traction motor for Toronto rapid transit cars and (below) armature





fields diverted for fast running. The motors are capable of accelerating a fully loaded car at the rate of 2·3 m.p.h. per sec. and will give the cars a top speed of about 55 m.p.h.

The motors will have skewed slots in order to minimize noise and will be ventilated by their own individual fans drawing clean air through ducts from inside the body of the coach. As is usual, four main poles and four commutating poles will be provided and the full complement of four brush arms included. All coils will be of the special fully pressed and Bakelized type enabling the maximum amount of copper to be provided in a given space. External tapered connections are being fitted to maintain an existing feature which is favoured in Toronto.

Traction Control Equipment

The British Thomson-Houston Co., Ltd., will supply all traction control equipment and carry out the erection of the equipment and the wiring of traction and auxiliary circuits. The control will be of the pneumatic cam magnetic type, generally similar to the large number of equipments already in use on the London Transport system. The equipment will be assembled in a single unit for mounting under the coach. The resistors will be of the lightweight R.P. type embodying edgewise wound aluminium chromium steel alloy strips mounted on ceramic insulators. The resistors will be housed in a separate frame for under-car mounting.

The braking system will be of the electro-pneumatic type as manufactured by the Westinghouse Brake & Signal Co., Ltd. All brakes on a train will operate simultaneously and those on a long train as quickly as on a short one.

Each car will have a retardation controller consisting of a mercury "U" tube having electrical contacts which are made or broken by the surge of the mercury. This serves to bring the train to rest smoothly and rapidly.

The lighting and heating systems will be provided by J. Stone & Co., Ltd. A lighting fitting over every seat will give an illumination of 25 ft-candles on the reading plane. In the case of a power failure, battery operated emergency lights will function automatically.

Heating and ventilating will be provided from 30 kW under-floor resistors over which air will be circulated to the car throug seat pedestal louvres. Thermostatic contr will keep the temperature between 62 an 65 deg F.

Crompton Parkinson, Ltd., will suppl 50 V batteries and motor generator se operating for the auxiliary supply. Th generator will be capable of a continuou output of 4 kW, the motor being supplie from the track current at a nominal 600 V. The l.v. system is provided to operate the various components controlling the traction motors, pneumatic doors, brakes, heating ventilating and other features. The m.g set will consist of two similar armatures on a common shaft surrounded by a commo frame containing two independent field systems to reduce space and weight.

The full output from the generator is obtainable with the track supply varying between 450 V and 600 V. The output is controlled by a carbon pile regulator normally giving a constant voltage characteristic but including a current limiting device which is operative, for example, when a full auxiliary load coincides with a discharged state of battery. The battery itself has an ample capacity to carry all the control loads as well as to supply the emergency lighting for a time sufficient either to complete a round trip on the railroad or to take the train out of service and unload the passengers. One battery and m.g. set can supply the requirements of two cars.

While this is the largest order which has been placed in the United Kingdom by the Commission, many other purchases have recently been made from British firms for other equipment and materials, including a complete automatic signal system for the subway, electrical equipment for several substations, steel piping, reinforcing steel, and other miscellaneous equipment amounting in value to $2 million.

Glasgow Engineering Centre

THE Engineering Centre, 351, Sauchiehall Street, Glasgow, has opened a catalogue library which contains the literature of more than 3,000 firms and also a complete set of British Standards. The facilities offered are already being put to good use by consultants, designers, draughtsmen and buyers, as well as by the many overseas visitors who now include a visit to the Centre in their itineraries. Manufacturers who have not included the Centre's name on their mailing lists for publicity matter are invited to do so.

Coal Burning Gas Turbines

Thomas Hawksley Lecture

THE 38th Thomas Hawksley Lecture was given on 16th November by Dr. H. Roxbee Cox at the Institution of Mechanical Engineers. It was in effect an interim report on the development work of the Ministry of Fuel and Power. After describing the organization and nature of this work, the lecturer discussed its bearing on the use of solid coal for gas turbines of four types. The first is an open-cycle, single-stage internal-combustion unit for which laboratory investigations are made by the Department of Scientific and Industrial Research at Greenwich and the British Coal Utilization Research Association at Leatherhead.

At the former station a tubular straight-through combustion chamber with multi-grid burner and a vortex chamber are employed. Both burn 500 lb/hr of pulverized coal, in suspension, the ash being separated in a dry state. At Leatherhead combustion occurs largely on the walls of a "cyclone" combustion chamber, where the molten ash remains and is withdrawn in a wet condition. The experimental Parsons 500 h.p. open-cycle turbine, for which the tubular burner is used, has been running since last February without cleaners on coal of which 80 per cent passes through a 200 B.S. mesh sieve. A 2,000 kW English Electric set for industrial service and incorporating a cyclone slagging chamber is due for trials next year. The plate heat exchanger (made for the English Electric Co. by Joseph Sankey & Sons) measures only 6 by 5·5 by 4·5ft.

Two-Stage Combustion Set

Since the aim is to run turbines on high-ash fuel without blade abrasion, a 2,000 kW two-stage combustion set is due to be completed by the Metropolitan-Vickers Co. which it is hoped will permit the use of coals that may be too dirty for single-stage combustion designs. In the first stage gas is produced and cleaned and in the second combustion takes place; about 10 per cent of the throughput will have to be cleaned, compared with about 40 per cent with the slagging chamber and 100 per cent with dry combustion. The supercharging compressor, of the same make, has an inward-flow (radial) turbine with controllable-incidence entry guide vanes. The gas producer, designed jointly by the Incandescent Heat Co. and Joseph Lucas, Ltd., will work at the highest pressure in Great Britain, viz., 6 atm.

Locomotive Turbine

An open-cycle external-combustion 1,800 h.p. 8,000 r.p.m. turbine is on order from Parsons for a 1,600 h.p. locomotive. Its expected thermal efficiency is 19 per cent at full load and 10 per cent at one-tenth load. Exhaust air from the work turbine is used partly for combustion and partly to reduce the temperature of the burnt gases before they enter the air heater, in which the maximum temperature is 1,560 deg F, compared with 1,300 deg F in the turbine. These gases give heat through the walls of a tubular air heater to compressed air, the working medium, on its way to the turbine. The compressor is driven by the high-pressure turbine and the power output by the low-pressure turbine. Torque characteristics resemble those of a steam locomotive, thus permitting direct drive. Train heating is provided by a steam boiler heated by exhaust gas from the air heater. Since the average thermal efficiency of a steam locomotive is only about 5 per cent a 50 per cent fuel saving would allow four or five times the present annual charges for a gas turbine.

Similarly, in the closed-cycle type the combustion products do not pass through the main turbines, although they do go through the turbine used for supercharging the air heater. With air heaters at atmospheric pressure, however, ash cannot attack the rotating parts and any damage is confined to the heater tubing. This type of heater with a straight-through combustion chamber is on order from John Brown & Co. to run with this company's existing 500 h.p. closed-cycle machine or with one of 1,000 h.p. now in hand.

A possible indirect use of coal is in

connection with firedamp (methane) found in proportions up to 1 per cent of the ventilating air in upcasts from mines. Investigations by Sir Alfred Egerton at Imperial College indicate that by preheating to about 1,800 deg F combustion occurs, but probable development seems to lie in its use with an auxiliary fuel, such as coke-oven gas or pit fines. A firedamp gas turbine on the basic lines of the coal burning unit has been ordered by the Ministry from the English Electric Co. and is to be installed by the National Coal Board next year. The burning of weak mixtures entails employment of a temperature booster operating as a regenerator with a temperature difference produced by the reaction to " drive " the heat exchanger.

Underground Gasification

Another way of obtaining gas is by underground gasification of coal of too poor a quality to be worth mining, of which there are possibly thousands of millions of tons in this country. From the horizontal drilling scheme started in July last year at Newman Spinney, near Chesterfield, during the first ten weeks 100 tons of coal were gasified with a total thermal yield of 67 per cent, made up of 49 per cent combustion gas, 11 per cent sensible heat and 7 per cent steam. Calculations suggest the possibility of producing gas on a full-scale system at from 1d to 2d a therm with a value of 2½d to 3d per therm as a power producer. To obtain experience with other kinds of coal, a further site is being prepared in Worcestershire. Within the next few months an economic assessment may be feasible.

In another method proposed, " total gasification," coal is converted into gas so completely that the only other product is ash. An interim report in February of this year by the Scientific Advisory Council advocated the adoption of the hydrogenation method integrated with the generation of electricity from the hot gases and carbon residues from gasification. Non-caking coals treated with hydrogen under a pressure of 25 to 30 atm. at 1,650 deg F are estimated to yield gas of well above 500 B.Th.U/cu ft.

Peat suffers from the disadvantage of containing over 90 per cent of water, which has normally to be reduced by air-drying to 30 per cent before being burnt. With the gas turbine it is hoped to remove the larger part of the water by mechanized means followed by further drying in the heat of the cycle. Ruston & Hornsby are engaged in an adaptation of their open-cycle 3 C T engine to peat burning, to be ready early in 1952. After 6 lb of moisture to each lb of dry substance has been removed by a Shaw hydraulic press, the remaining 2½ lb is reduced by evaporation to provide a powder of 30 per cent humidity for combustion in the turbine. This is done in a flash dryer in the 896 deg F exhaust from the turbine. If these experiments are successful a proposal of C. H. Secord (1948) will be considered. In this peat is dried under cycle pressure by gases at turbine-inlet temperature, the resulting steam passing with the products of combustion through the turbine. With this arrangement the power/weight ratio is some five times that of the plain peat gas turbines. The North of Scotland Hydro-Electric Board and John Brown & Co. have worked out a scheme for burning peat in an air heater for use in association with the 500 h.p. open-cycle turbine previously mentioned.

Compressors for all the turbines referred to above are of the axial kind, but Dr. Cox holds that up to 2,000 h.p. the centrifugal type may be preferable. Its lower efficiency (85 per cent, as against that of 90 per cent and over) may be less important in small sizes than its superior robustness and cheapness. A two-stage centrifugal compressor has been ordered from D. Napier & Son for fitting to the English Electric turbine; a compression ratio of 5 to 1 will be obtained with an optimum top speed of 1,100ft/sec and an air mass flow of 40 lb/sec at 8,250 r.p.m.

Included in the other power resources dealt with more briefly in the lecture were winds, tides, pumped storage in connection with hydro-electric schemes, the sun, the fuel cell, the heat pump and nuclear fission. In regard to the last Dr. Cox remarked that at the present stage no more could be said than that a power station using an atomic source of energy would not necessarily be a less economic proposition than one of a conventional kind.

E.I.B.A. Concert

A concert in aid of the Electrical Industries Benevolent Association will be given on Friday, 21st December, at the Brookhirst Switchgear Works, Chester. Tickets are obtainable from Mr. G. P. Belsham, Brookhirst Switchgear, Ltd., Northgate Works, Chester.

Commerce and Industry

Chamber of Commerce Expels Board

Import Licence Procedure

THE Hereford and District Chamber of Commerce decided at a meeting on 27th November to expel the Midlands Electricity Board from membership, on grounds of unfair trading in competition with private traders which, it was said, was inconsistent with membership of the Chamber.

The President, Mr. J. P. Inglis, said that the Council of the Chamber had expressed the opinion that the M.E.B. should not continue as a member. Mr. G. W. Elson, M.E.B. district manager, Hereford, said he thought the attitude of the Council was open to criticism because the Board had not been informed of this matter and had not had notices of meetings.

Mr. Inglis said they had had repeated allegations of unfair trading by the Board, particularly in connection with extended credit, and if the Chamber considered that the Board was giving terms beyond the capacity of a private trader, then they should have a resolution on it.

Mr. Elson replied that he had to administer the policy of the M.E.B. They had been told nothing of this criticism of trading in the past. He had had no notice that any question of unfair trading was going to be raised and had not come prepared to answer it.

Mr. A. C. Edwards, proposing the expulsion of the M.E.B. from the Chamber, said the Board was able to borrow money at a much cheaper rate than the private trader. He asked if they, as taxpayers, were going to subsidize the M.E.B. Twenty-eight members voted for the motion and one against; there were two abstentions.

Films for Industry

Practical guidance on the sponsoring and distribution of industrial films is given in "Films for Industry," a booklet compiled by the Home Publicity Committee of the Federation of British Industries. This booklet, the third of a series on industrial public relations, is addressed to industrial firms and trade associations that have no first-hand knowledge or experience of film-sponsoring or of the channels through which industrial films are distributed. After outlining the questions a film-sponsor should ask before deciding on the making of a film, the booklet describes the various kinds of film that can be made on industry's behalf. Information is given on such essential points as the preparation of the film "brief" and copyright, and on the factors that affect the costs of films and film-strips. The booklet also describes the channels and services by which industrial films are distributed to the large "non-theatrical" audience which meets in such places as schools, clubs, institutes and works canteens. An appendix, prepared by the Board of Trade and the Government Overseas Departments, gives detailed guidance on the use of films for the promotion of British trade overseas. Copies of the booklet can be obtained from the F.B.I. at 1s 8d each.

Ferranti Transformer at Torquay

A 12 MVA, 33/11 kV, three-phase Ferranti transformer was recently delivered to the St. Marychurch substation, Torquay, of the South Western Electricity Board. Owing to the narrow approach to the substation special consideration had to be given to transport of the transformer. Even so it was delivered complete with on-load tap change gear in position as a works assembled unit. The approach to the substation is through a lane, which at its widest point is 9ft 6in, but narrows to 9ft 2in in the middle, and the overall width of the vehicle

Ferranti transformer being delivered to a Torquay substation

and transformer was 8ft 4in. A right angle turn had to be negotiated. The illustration shows the vehicle passing into the narrow portion of the lane.

City and Guilds Publications

Four new publications have been issued by the City and Guilds of London Institute. These are the annual report for 1950, general regulations, examination results for 1950, and regulations and syllabuses for examinations in telecommunications and electrical subjects for the 1951–52 session.

Telephone Development

Since 1st January, 1946, the number of telephones throughout the country has increased by over 1,670,000, bringing the total at the end of September last to 5,581,800. In the same period the number of applicants on the waiting list increased from 300,000 to 499,000. At the end of September, 392,800 subscribers were sharing an exchange line, and of these 89,300 were business subscribers. During the year ended 31st March, 1951, the number of effective local telephone calls totalled 3,076 million, and there were 250 million trunk calls. Outgoing calls in the Continental services amounted to 1,245,000 and 82,000 outgoing calls were made on the international radio-telephone service.

L.C.C. Exhibition

In our last issue we referred to the L.C.C. Festival Year Exhibition "London Education," which was opened at County Hall last week. Children from secondary schools and adult students from technical colleges have contributed to the display. Among the many examples of their work on view is a television set made from scrap components by boys of a secondary school, while the scale models include a power station which has been constructed by two boys as homework. This model is shown in the accompanying illustration.

Exemptions from Key Industry Duty

The Board of Trade is considering the question of the renewal for the period 20th February, 1952, to 18th August, 1952, of exemptions from key industry duty. Any communications on the subject should be addressed to the Industries and Manufactures Department, Division 1B, Board of Trade, Horse Guards Avenue, Whitehall, London, S.W.1, not later than 24th December.

Parnall (Yate) Sydney Showroom

Parnall (Yate), Ltd., will shortly be opening a showroom and service centre in Sydney, Australia, to deal with the rising volume of orders from the Commonwealth. The centre will be managed by Mr. P. Ryan, who has been Parnall's technical representative in Australia for the last fourteen months.

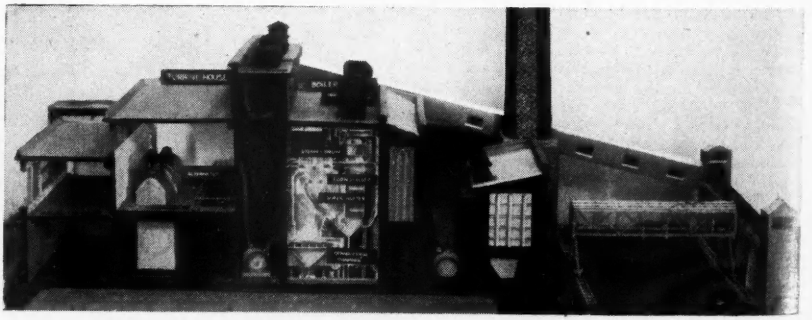
Plaster Board Manufacture

Referring to the description of the factory of British Plaster Board, Ltd., in our issue of 9th November, W. J. Furse & Co., Ltd., Nottingham, inform us that they were responsible for the whole of the electrical installation work in the new factory.

Vote Recording System

The City of Birmingham has adopted a vote recording system which provides an automatic means of indicating, counting and recording votes accurately and speedily. In front of each member's seat are fitted two push-buttons, one coloured green and the other red, designated "Aye" and "No" respectively. Conveniently positioned to the right hand of the Lord Mayor is a small control and result panel. Fixed to the wall are two vote "display" and total "result" panels, in positions clearly visible from the Council seats and the gallery. The number of every member's seat is indicated in a separate square on each

A model power station constructed by two secondary school boys on show at the L.C.C. "London Education" Exhibition



panel and fitted with two lamps for each seat. The lamps are coloured green and red, respectively. Along the top is a glass panel, on which is displayed the result of the voting. The total number of votes "for" appears in illuminated green figures and those "against" in red. The equipment which performs the function of counting is of standard telephone type, consisting of relays, uniselectors, etc. This apparatus is accommodated in a floor pattern cabinet and is placed in a small adjacent room, together with the automatic chart recorder showing how each individual member has voted. The equipment has been designed, manufactured and installed by the Reliance Telephone Co., Ltd., a subsidiary of the General Electric Co., Ltd., which has supplied similar installations to the Middlesex County Council, City of Manchester and many overseas administrations.

Trade with Nicaragua

Although the total value of imports from the United Kingdom into Nicaragua during 1949 declined as compared with the preceding two years, there has been a great increase in the value of imports of electrical machinery. In his report on the economic and commercial conditions in Nicaragua (H.M. Stationery Office, 1s 3d net), Mr. N. O. W. Steward, O.B.E. (H.M. Minister and Consul-General at Managua), says that in addition to the increased demand for electrical machinery, small British stationary diesel engines for pumps and electric generators have proved popular in recent months. The value of electrical machinery imported from the United Kingdom in 1949 was U.S. $12,872, as compared with $412 in 1948 and $161 in 1938.

"Ekco" Display Competition Results

The "Ekco" national window display competition which, this year, ran during the whole Festival period from May to September, attracted the largest number of entries received since this annual event was introduced. Once again co-operation between art-school students and "Ekco" dealers was a feature and "student-dressed" windows won first and third prizes in the main competition. There were also special prizes for students only.

The winners of the first prize (£100) in the dealers' section were Geo. Watson, Ltd., 811, Green Lanes, London, N.21. J. W. Gray, Ltd., Scarborough, won the second prize (£50), and Currys, Ltd., Harrow, Middlesex, the third (£20). The runners up were Willmotts Stores, Ltd., Norwich, and Offer Radio, Ltd., Surbiton, Surrey.

In the students' section the first prize (£20) was awarded to Miss Daphne S. Dall (Hornsey School of Arts and Crafts), who dressed the window of Geo. Watson, Ltd. Messrs. M. Solley and D. Newton (Medway College of Art, Rochester, Kent) won the second prize (£10), and Miss I. Payne (Portsmouth College of Art), the third (£5). The runners up were Messrs. J. P. Martin and A. S. Halls (Harrow School of Art and Willesden School of Art) and Messrs. W. D. Morris and M. F. Mayhew (Newcastle-under-Lyme School of Art).

Courses for Board's Junior Staff

During the present month the East Midlands Electricity Board is holding a series of one-day courses at Leicester which will be attended by most of the junior staff employed in the Board's fifty service centres. The main theme of the courses is "Service to the Consumer," and an educational background is being provided by lectures, demonstrations and E.D.A. films. The chairman, Mr. C. R. King, and the deputy chairman, Mr. J. Mould, attended the opening conference held on 6th November.

Wire Reference Book

We have received from Mr. N. Lindsay, Sharrocks Street, Wolverhampton, a copy of the "Wire Reference Year Book and Directory." This is the first edition of this reference book, which is designed to provide a complete guide to those engaged in the wire industry. There are 6,000 references in its 164 pages, and the various sections include an alphabetical list of wire manufacturers, giving addresses of overseas branches and agents, wire tables, B.I.O.S. reports, B.S.I. specifications, a classified buyers' guide, a galvanizers' glossary, and much other information of interest to the trade.

Changes of Name

Venner Time Switches, Ltd., is holding an extraordinary meeting on 18th December at which a resolution will be submitted changing the name of the company to Venner, Ltd.

Efandem (1949), Ltd., has changed its name to Efandem Co., Ltd.

Speedy & Eynon (Electrical), Ltd., have changed their name to Engineering Services (B'ham), Ltd.

The Elmbridge Instrument & Radio Co., Ltd., has changed its title to Elmbridge Instruments, Ltd.

Large Pumping Stations

In the abstract of the paper by Messrs. G. A. Wauchope and H. P. Humphreys in our issue of 23rd November (p. 1063) it was erroneously stated that the power of the main condenser circulated water pumps in a modern power station might exceed 100,000 h.p. This figure refers to the whole of the power stations controlled by the B.E.A. and not to a single station as implied.

Norwegian Export Trade

From the Norges Eksportråd (Norwegian Export Council), Solplassen, 1, Oslo, we have received an elaborately produced illustrated

review of "Machinery and Metal Products Exports," in English. It comprises eight articles dealing with separate classes of goods exported from Norway, with an introduction and a list of exporting concerns. One section deals with "electrical machinery and fixtures," but electrical applications are also touched on throughout the publication.

Hoover Display Contest

A national window display contest or prizes totalling over £800 has just been held by Hoover, Ltd., among its dealers. There were over 900 entries. The national prize-winners, who were awarded 100 guineas and a special challenge cup, were Adams & Jarrett, Ltd., St. Leonards-on-Sea. The contest was judged by a tribunal consisting of Mr. E. Lucking (national chairman, British Display Association), Mr. A. J. Symes (editor, *Display, Design & Presentation*), Mr. L. N. Thompson (director, Erwin Wasey & Co., Ltd.), and from Hoover, Ltd., Messrs. F. H. Bunn (director and general sales manager), S. Roberts (home sales manager), W. M. Tribute (advertising and publicity manager), A. W. Bunn (sales promotion manager) and H. D. Walsh (display and exhibition manager).

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £124 0s 0d
COPPER, H.C. Electro	ton £227 0s 0d
Fire Refined 99·7 per cent	ton £226 0s 0d
Fire Refined 99·2 per cent	ton £225 10s 0d
COPPER Tubes	lb 2s 2d
Sheet	ton £280 0s 0d
H.C. wire and strip	ton £254 0s 0d
LEAD, English	ton £176 10s 0d
Foreign	ton £175 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £915 0s 0d
ZINC, G.O.B. Foreign	ton £190 0s 0d
Electrolytic	ton £194 0s 0d
BRASS Tubes	lb 2s 1d
Sheet	lb 2s 4½d
Wire	lb 2s 7¾d
PHOSPHOR BRONZE	
Wire	lb 3s 7⅛d
RUBBER, No. 1 R.S.S. spot	lb 41½d–42¼d

Restricted Imports and Credits

The Board of Trade announces that import licences for the goods recently restricted are being issued on the basis of an importer's past trade in the particular goods in question. Where a licence issued to an importer on this basis is sufficient to cover the goods purchased by the importer against irrevocable credit, such goods must be a first charge against the licence. If a licence granted on the basis of past trade is less than the amount of confirmed or irrevocable credits outstanding on 8th November the Board will consider the issue of an additional licence to cover the balance of the credits. The grant of licences will also be considered in the case of importers who are not entitled to a quota licence on the basis of their past trade but who can establish that the goods concerned have already been paid for, or are to be paid for, under confirmed or irrevocable credits established before 8th November. In either case it may be necessary to deduct the value of the goods covered by the licence from any quota to which the importer may be entitled in the next licensing period.

If an additional licence is desired the necessary proofs will have to be furnished to the Import Licensing Branch.

Industry and Parliament

At the business men's meeting of the Empire Industries Association and British Empire League, Mr. L. Gamage, vice-chairman and joint managing director of the General Electric Co., Ltd., and president of the Institute of Export, gave an address in which he expressed his views on what industry needs from Parliament, in which he said that industry required general guidance from the Government on its economic policy and the creation of conditions under which industry could operate with the greatest efficiency and attain the highest prosperity. He elaborated the methods by which these objectives could be attained.

Catalogues and Lists

Ekco-Ensign Electric, Ltd., Southend-on-Sea, Essex.—Priced and illustrated catalogue of lamps of all types and sizes.

Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.—Priced catalogue and four folders on lamps and lighting equipment.

Richard C. Gibbins & Co., Ltd., 43, Berkley Street, Birmingham, 1.—Illustrated folder on inland cable-laying equipment.

Gowshall, Ltd., Lambs Conduit Passage, Red Lion Square, London, W.C.1.—Catalogue of road traffic signs.

H. J. Baldwin & Co., Ltd., Baldwin House, 132, Arkwright Street, Nottingham.—Priced folder on "Thermat" electric blankets and pads.

Normand Electrical Co., Ltd., North Street, Clapham Common, London, S.W.4.—Catalogue of "Neco" geared and other motors of up to 5 h.p.

Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C.1.—"Atlas" fluorescent lighting handbook containing full technical details and prices of the company's entire range of fluorescent lighting equipment.

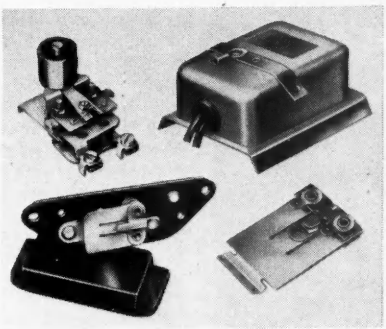
Horace Green & Co., Ltd., Station Works, Cononley, Keighley, Yorks.—Two technical leaflets dealing respectively with totally enclosed a.c. motors of up to 50 b.h.p. and a.c. electric suds pumps.

Thermostat Manufacture

Development of Types for Motor Protection

SINCE Otter Controls, Ltd., were established four years ago their business in the field of thermostatic control has so expanded that besides having to absorb more production space at their original works at Buxton, they have also set up a branch factory at St. Davids, Pembrokeshire.

The basic feature of all the company's control devices is the bimetal micro-switch element. Designed as a result of wartime experiences of Mr. E. H. Taylor, the company's managing director, in the manufacture of airmen's heated clothing, this element is "E" shaped and by stressing the outer legs inward and clamping them, the need for a separate snap action spring is eliminated. As the inner leg carries twice as much current as the outer legs, it heats up four times as much and presses the contacts together to act as a fulcrum until the element reaches its dead centre and snaps the contacts open.



Top left: **Stop start unit and, on right, Type P clamp-on motor protection unit.** *Bottom left:* **Combined motor protection thermostat and terminal block and on right, change-over switch for controlling the mixing temperature of liquids**

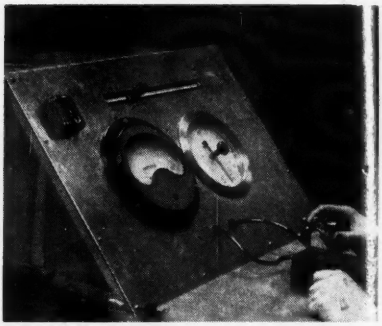
The first type of control made was designed to clamp on to the cylinder block of a motor car to indicate by means of a pilot light when the temperature was high enough for the choke to be cut out. There is now a range of devices covering the automatic change-over on starting carburettors, the switching on and off of the heating elements on motor car induction manifold heaters in cold climates, water heating, transformer oil temperature indicators, snap-action "Blanketstats," and motor protection units, thermal trips, stop/start and change-over switches. New products just being put into production include a small unit for car windscreen wiper motor protection and a device for protecting radio transformers. The company is specializing now on the overload protection of fractional h.p. motors.

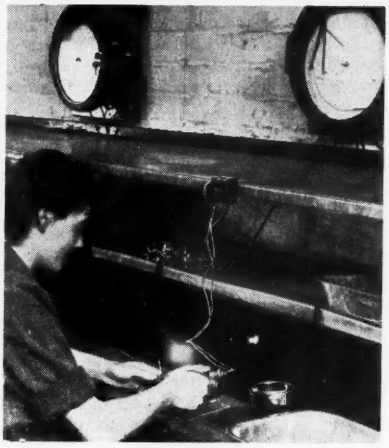
In view of their wide applications the motor protection units are of particular interest. Hitherto they have been arranged for clamping to the motors of existing installations by means of spiral springs, but in the latest design alternative provision is also made for screwing on, together with conduit entry. The new design also provides for manual resetting. For internal fitting by the manufacturer two different types are available, one of which also embodies the motor terminal block and so becomes an integral part of the motor. They can be supplied for manual resetting, and also for dual voltage to cater for overseas markets.

Arranged to come into operation at approximately 80 deg C, these units give protection against both overload and overheating, as well as against excessive current. Protection is given equally to an overloaded and badly ventilated motor as to a completely stalled motor even when the latter is cold.

The thermal trip and the stop/start switch are both being extensively used on fan unit heaters. The former will switch off at any predetermined temperature and remain off until manually reset. The stop/start unit can also be switched off to allow the fan to blow out cool air during hot weather. Throughout the range of products any desired degree of accuracy from $\pm \frac{1}{2}$ deg C upwards can be provided.

Although the company now lists sixteen





Top left: **Stamping out the bimetal elements.** *Above:* **Testing the operating cycle of the bimetal elements.** *Left:* **Setting the thermostats individually in thermostatically controlled oil baths**

standard products, it does a large amount of special work. One such device is used in the Bendix washing machine to operate the two solenoids of the water mixing valves and is arranged in such a way that the bimetal does not carry any current. Another special model is designed to switch off a mercury arc rectifier if the cooling fan fails and through an auxiliary circuit switches on an indicating lamp.

For all its various devices the company normally uses one of three different sizes of bimetal switch element, the different operating characteristics being achieved by varying the composition or thickness of the bimetal blade employed. From a manufacturing point of view it has been found more economical in most cases to utilize strip with silver inlaid in phosphor bronze rather than rivet on silver contacts.

At present every thermostat is individually set in oil in thermostatically controlled tanks heated by 12 V woven wire elements and agitated by impellers. After setting, the thermostats are taken by a small automatic lift to the floor below where they are degreased in trichlorethylene and returned upstairs for test and despatch. Setting will, however, soon be greatly accelerated by the use of a continuous automatic grading device which has just been installed.

The company's thermostats are being manufactured under licence in the United States.

Mechanical Engineering Congress

THE fourth International Mechanical Engineering Congress is to be held in Stockholm from 4th to 10th June, 1952; the papers and discussions will be centred on improvements of materials used in engineering manufacture. This Congress is organized by the trade associations serving the mechanical engineering industry of Belgium, Denmark, Finland, France, Western Germany, Great Britain, Italy, the Netherlands, Norway, Spain, Sweden and Switzerland.

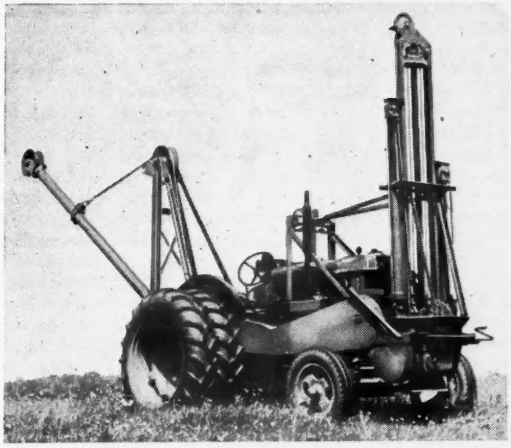
A meeting of the Organizing Committee comprising representatives of all these countries was held in London recently under the chairmanship of Mr. A. W. Berry, director of the British Engineers' Association, 32, Victoria Street, London, S.W.1, from which address information concerning the Congress is available.

The works to be visited include those of the Allm nna Svenska Elektriska AB (ASEA) and Telefon AB L. M. Ericsson.

Overhead Line Erection

Mechanical Borer Unit

By G. R. LOMAX,
A.M.I.E.E.



Lennox-Lomax line erection machine

TO build a mechanical power line erection unit around a tractor is an idea both natural and attractive. Such a prime mover is relatively cheap to buy and has low running costs when paraffin is used as a fuel. A machine of this type has recently been developed, and has successfully demonstrated its capabilities during extensive testing in the Portsmouth area of the Southern Electricity Board, drilling in various soils including flint and Southdown chalk.

The borer unit is mounted at the front of the tractor in trunnions and can quickly be turned through a wide angle to provide for vertical boring on sloping ground. Raising and lowering of the drill is by hydraulic power; two rams are fitted and these are fed from a gear type pump capable of giving more than one ton/sq in pressure. The drive of the unit is by heavy roller chain through a clutch type pulley to a spiral bevel gear box.

The two-speed winch is also chain driven and is placed at the rear in a welded box frame which ensures rigidity under the most onerous conditions. It is provided with earth anchors which enable it to withstand very heavy loads with a minimum jacking effect. When used for direct pulling, as when tensioning conductors, the bond is fed through large steel rollers to reduce friction. The winch can also be worked with a jib for lifting purposes. The jib is of tubular steel and extensible from 12ft to 18ft in height. At the maximum lifting position it is capable of supporting loads of up to 1 ton. The steel rope provided is of $\frac{5}{8}$in diameter and 75 yd long.

Only one machine operator is required, the rotation and vertical motion of the drill being controlled from the same position at the front of the equipment, but two labourers are needed to fix lifting tackle to the pole, to guide the pole into the excavation, to remove the lifting gear and on occasions to clear loose soil from the top of the excavation during drilling. Two additional men are required for back-filling and ramming so that a complete team consists of five men, including the operator.

The machine is driven up to the peg position and the boring unit adjusted for vertical drilling. On firm ground the front wheels are an adequate support for the drilling operation. On soft ground it may be necessary to spread the front weight over a greater area, and so a steel pad hinged upon the front axle is used. The drill is lowered until the thrust against the ground surface causes the front wheels to rise sufficiently to swing the pad into position, and the weight is transferred to the wheels by raising the drill again. The operator can then start boring, the depth

excavated before lifting the auger clear from the hole depending upon the nature and wetness of the ground. Soil is removed from the blade either by rotating against a scraper or by spinning, the faster rotation being obtained through a second drive sprocket and friction clutch.

Speed of drilling naturally depends upon ground conditions, but the machine is very robust and successfully excavates in gravel soil with large random stones and chalk containing bands of flint. Boulders, of course, must be removed by hand. A renewable shear pin is inserted in the drive in order to guard against damage to the machine.

Labour economies attainable by using this unit are perhaps more obvious than economies in cost. The latter, however, become evident with increasing machine load factor. In normal circumstances it will generally be found that the machine pays for itself on drilling and pole erection work at a machine load factor of approximately 60 per cent, that is, working three days out of five.

An attractive feature of the unit is its diversity of functions, particularly so when there is difficulty in keeping a machine fully occupied upon pole erection. At such times the machine may be usefully and remuneratively employed upon hauling, pulling, lifting, loading and unloading in a variety of ways. The high degree of mobility can be further extended by fitting twin rear wheels; when this is done the machine will go practically anywhere.

A similar, but larger boring unit can be mounted on a four-wheeled chassis for the purpose of excavating for steel tower footings up to 9ft deep and 6ft in diameter.

The Lennox Motor Co., Ford main agents of Southsea, Hants, took a principal part in the development of this Lennox-Lomax auto line erection unit, and are the sole agents for the machine. The manufacturers are Auto-Mowers, Ltd., Norton St. Philip, nr. Bath.

Magnetic Tape Recording

I.E.E. Radio Section Paper

IN a paper which was presented at a meeting of the Radio Section of the Institution of Electrical Engineers in London this week, Mr. P. E. Axon (B.B.C.) describes an investigation which has been made into the mechanism of magnetic tape recording. A number of explanations of the mechanism of magnetic recording, using both h.f. and d.c. bias, have been published in the past, most of which have been based on the behaviour of the magnetic recording medium (the tape or wire) under steady-state conditions, i.e., after it has been subjected to sufficient cycles of alternating magnetic field to have reached a symmetrically cyclically magnetized condition.

Mr. Axon's paper demonstrates that the intensity variation in a magnetic tape passing through a recording gap forms part of a series of unclosed and markedly asymmetrical hysteresis loops. The effect of asymmetry is investigated theoretically and shown to give distinctive properties to the recording and distortion characteristics of unbiased recording. The gap length of the recording head is critical under these conditions and leads to the occurrence of maxima and minima of recorded level and distortion at specific wavelengths. These properties are confirmed by experiment, and the mechanism of recording employing h.f. bias is examined in the light of the findings. It is shown that the number of bias cycles normally available during the time a tape element is in the recording gap is insufficient for hysteresis symmetry to be attained.

Various predictions are made concerning the transitions which may be expected in the recording and distortion characteristics as the h.f. bias field is increased from zero to saturation value. These transitions have been demonstrated experimentally, and it is shown that adequate h.f. bias eliminates the asymmetry of the a.f. intensity variation. A symmetrical variation of a.f. intensity results in the recording and distortion characteristics normally observed. The effect of a bias-leakage field outside the recording gap is discussed briefly with reference to the coercivity of the tape material.

Engineering in Europe

Survey of Current Literature

THE basic idea of the method of ascertaining the temperature rise by d.c. measurements of the resistance of the windings of the loaded transformer is simple enough, its purpose being to obtain a continuous record of the temperature process. The d.c is injected into an earthed phase, the d.c. source being protected against the a.c. by either an inductance coil or a plug circuit. Also, the d.c. magnetization has to be limited by inserting a transformer between alternator and tested transformer and keeping the d.c. measuring current small against the a.c. magnetizing current.

In the actual experiment the three phases of the h.v. side were energized by a.c. and two phases by d.c., the l.v. side being short-circuited. Currents and voltages, both a.c. and d.c., were measured in a single phase. The d.c. was injected through the neutral and the p.d. (on d.c.) between neutral and the three interconnected terminals on the l.v. side was measured. The results enabled heating and cooling curves to be traced from which the true time constants and temperature gradients could be determined. " Measurement of the Temperature Rise of Transformer Windings by Superposition of the Continuous Measuring Current on the Alternating Load Current," J. Derippe, *Bulletin de la Soc. Française des Electriciens*, Vol. 1 (7th Series), pp. 273–278, June, 1951, in French.

Induction Heater Design

The design is explained of a heater to produce an approximately constant temperature in a certain zone of the work by inductors of cylindrical shape. The method used is merely that of the classical equation of heat conduction, by which the conditions for achieving steady state conditions are determined. When several inductors are used their effects obey the law of undisturbed superposition, which applies to infinite as well as to finite length of rods and tubes.

The special cases treated are: one inductor placed centrally, eccentrically, or at the end; two inductors (on rods or tubes of finite length) and the fully equivalent case of rods or tubes of infinite length with single or paired inductors " repeated " with a certain " period " 2 d. That it should be possible to approximate any required steady-state temperature distribution along a rod by using the superposition principle could never be in doubt, but the demonstration of it and the practical design of inductors for the purpose are of some value. However, granted the correctness of the deductions for solid rods, it seems that the problem of tubes is rather over-simplified by this treatment.—" Induction Heating of Rods and Tubes," E. Langer, *Elektrotechnicky Obzor*, Vol. 40, pp. 180–189, No. 7–10, 21st May, 1951, in Czech.

Lightning Arrestor Requirements

The h.v. laboratory of the Leningrad Polytechnical Institute has since 1946 co-operated with the " Proletarii " works for improving the performance of " Vilite " lightning arrestors and a considerable amount of research had to be done before the practical problem could be solved. This research yielded above all very valuable general results on the required operating characteristics of lightning arrestors, as it revealed that the requirement that they must pass currents up to 100 kA for the impulse waveform 5/10 μ sec (U.S.A. Standards) is quite unfounded in actual practice.

Lightning currents very rarely reach even 30 kA, but the waveform of the lightning surge is mostly quite different, the average " length " being 20–100 μ sec, sometimes as long as 1,000 μ sec. It was found that the waveform giving the most reliable results in tests, especially of the

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at the current rates.—*Editors, Electrical Review.*

energy conditions during a lightning surge, is the 20/40 μ sec wave, with impulse amplitudes of 3–20 kA. Other tests were made with wavelengths up to 1,000 μ sec.

The main object of the tests was to improve the durability of the carborundum discs of the arrestors under repeated strokes, and the service life of the disc groups in terms of surges sustained could actually be improved by a factor five. This result was obtained by comprehensive statistical evaluation of the numerous test series, which included oscillographic observation of the disruptive process in the discs, and by use of the test results for improving the technology of the production process of the discs.—" The Surge Characteristics of Modern ' Vilite ' Arrestors," A. A. Gorev and A. I. Piryazeva, *Elektrichestvo*, No. 9, pp. 3–10, September, 1951, in Russian.

Voltage Gradients near Substations

The substation in question was frequently affected by serious breakdowns, mainly due to voltage surges on the lines and to direct lightning hits in the neighbourhood of the station. Systematic investigations were undertaken for exploring the potential distribution on the ground (which was known as being badly conductive), estimating the danger factor above the interconnected (" meshed ") earthing system and for observing the behaviour of the various " earths " under impulse waves. The general advantages of the interconnection of the earths for the protection of the equipment of the substation, particularly the power transformers, and the effect of the interconnection on the danger factor, were also investigated.

The article reports the results in a comprehensive way. The interconnected earthing system is obviously only used for the h.v. equipment, indoors and outdoors, such as the frames of the transformers, switchgear, pylons, etc., whereas auxiliaries, measuring circuits, transformer neutrals and especially the telephone system have their separate earths.

The graphs of the step voltages and measurements of currents through a model representing the human body prove that no real dangers exist in the case of system faults, as the body currents do not exceed 7 mA, though they might be much higher with faults in the 60 kV system but only for fractions of a second, so that there is hardly any danger risk. Some improvements that are still possible in the earthing system are suggested.—" Systematic Investigation of the Potential Gradients in the Neighbourhood of and inside a Substation (60–30–15 kV Substation of Valentine, Haute-Garonne)," G. Bodier, *Bull. Soc. Française Elect.*, Vol. 1, pp. 403–416, July, 1951, in French.

Repairs and Maintenance

The standards of maintenance and replacement of electrical equipment declined sharply during the war under the pressure of shortages of men and materials, the overriding importance of armaments production and, naturally, where frequent air-raids caused heavy damage. The repairs had to be made as quickly as possible, often during enemy action, and with what materials were just at hand. There are still shortages in most fields even now, but the strained post-war economy of most countries can afford stoppages of production due to breakdowns of electricity supply even less than in pre-war times. Also, the dangers to human life and health must not be under-rated and thus overloads and system faults must be reduced to the minimum if they cannot be entirely prevented.

Frequent inspections of the plant (which has to be disconnected and short-circuited during these inspections), including the earth connections, will go some way towards reducing the incidence of faults, provided due attention is paid to all potential sources of danger, such as fuses (ratings), circuit-breaker contacts, earth electrodes and leads (corrosion), and condition of the insulating oil in transformers and circuit breakers. Dust and moisture deposits may cause great trouble, unless they are removed in time. Short-circuit currents must always be checked by calculation and tests and their thermal and mechanical effects must be known in order that the protective relays may be set accordingly.

Great dangers arise from inexpert handling and repairs of cable connections. Where h.v. machinery and apparatus are concerned, detailed maintenance instructions are mostly available, but they have to be carried out and this requires a really well-trained personnel.—" Correct Operation and Maintenance of Electrical Installations in Industry," M. Gerlach, *Elektrotechnik*, Vol. 5, No. 8, pp. 355–360, August, 1951, in German.

ELECTRICITY SUPPLY

New North Western Tariff

Proposed North Wales Bill

FROM the first normal meter readings after 31st December the North Western Electricity Board is introducing a new block tariff for domestic consumers comprising an initial charge of 5d/kWh (prepayment supplies 6d) and a secondary charge of ⅜d/kWh. In the case of dwellings with up to five assessable rooms the first 36 kWh a quarter will be charged at the higher rate and for each additional assessable room up to a maximum of sixteen a further 12 kWh will be paid for at this rate. No meter rents will be charged except where a consumer requires an extra meter for his own use; "out of borough" and other special charges will also be abolished. It is estimated that about a third of the domestic consumers in the Area will have their charges slightly increased and a third will pay less, but the "average maximum disturbance" will be only about 1¼d a week.

Street Lighting at Crawley

A trial installation of Siemens F.T.F. 2512 "Wilton Sieray" fluorescent lanterns used for Class "B" lighting has been carried out at Crawley New Town. These are mounted on "Tarslag" type 500 columns and brackets, the overall design (which allows for the lantern to be mounted at an angle to the roadway) being created in conjunction with Crawley Development Corporation. The lantern houses the instant start control gear and is for use with two "Sieray" 2ft 40 W fluorescent lamps giving a road surface distribution of 1,800 lumens per 100ft linear on a 16ft wide carriageway with a 6ft wide footway paving. The lanterns, control gear and lamps were supplied by Siemens Electric Lamps & Supplies, Ltd., and the installation was carried out by the South Eastern Electricity Board under the supervision of the chief engineer of the Crawley Development Corporation. The chief architect of the Corporation acted as consultant upon the overall design.

Part of an experimental street lighting installation at Crawley New Town

North Wales Power Schemes

The British Electricity Authority has given notice of its application to Parliament for leave to introduce a Bill enabling it to proceed with various hydro-electric works in North Wales. The Authority seeks powers to construct aqueducts and reservoirs in a number of districts in the counties of Caernarvon and Merioneth and use the waters of a number of lakes, rivers and streams. Copies of the Bill may be inspected at and are obtainable (2s each) from the Authority's offices at Bron Heulog, Conway Road, Llandudno Junction; the offices of the Merseyside & North Wales Electricity Board, High Street, Blaenau Ffestiniog; or the offices of Dyson, Bell & Co., 15, Great College Street, Westminster, S.W.1.

Ocker Hill Extensions

Tipton Borough Council has received notice from the British Electricity Authority of an application which has been made to the Minister of Fuel and Power for consent to the extension of the Ocker Hill generating station. Provision

is included for an additiona concrete cooling tower. After considering a petition signed by 548 owners or occupiers of property in the vicinity of the station, the General Purposes Committee has recommended the Council to lodge a formal objection to the proposed extension, with the proviso that the Council will be prepared to withdraw the objection on being given an assurance that efficient methods will be used continuously by the B.E.A. to eliminate the emission of moisture and grit and to prevent a repetition of the nuisance which existed for some considerable time in the Ocker Hill area following the installation of the existing cooling towers and other plant at the generating station.

South Uist Diesel Station

The Secretary of State for Scotland has confirmed a scheme prepared by the North of Scotland Hydro-Electric Board for the construction of a diesel generating station at Daliburgh, South Uist. The estimated cost is £52,000.

Power Station Consents

The British Electricity Authority has received the consent of the Ministry of Fuel and Power to extensions of the Deptford East and Littlebrook "C" (Dartford) power stations. The extension at Deptford East consists of one 52·5 MW turbo-alternator and two 250,000 lb/hr boiler units. The Littlebrook "C" extension comprises a 60 MW turbo-alternator and two 360,000 lb/hr boiler units.

B.E.A. Contracts

During the past month the British Electricity Authority has placed contracts for equipment for power stations, transforming stations and transmission lines amounting in the aggregate to £13,149,708. The principal contracts include the following:—

East Yelland power station, nr. Barnstaple: Main and auxiliary power cables, control cables and accessories.—Aberdare Cables, Ltd. Portishead "B" station, nr. Bristol: Foundations of buildings, circulating water system, cable tunnels, coal store, and ancillary work.—Chas. Brand & Son, Ltd. Brimsdown station, nr. Enfield: Two 340,000 lb/hr boilers.—John Thompson Water Tube Boilers, Ltd. Castle Donington station, nr. Derby: Preliminary civil engineering work.—Wm. Moss & Sons, Ltd. Drakelow station, Burton-on-Trent: Main and auxiliary cables and accessories.—British Insulated Callender's Cables, Ltd. Bold station, St. Helens: Two 300,000 lb/hr boilers.—Yarrow & Co., Ltd. Connah's Quay station, nr. Flint: Two 300,000 lb/hr boilers and coal handling plant.—International Combustion, Ltd. Ince station, nr. Ellesmere Port: Foundations and culverts.—Holland & Hannen and Cubitts, Ltd. Clarence Dock station, Liverpool: Three 350,000 lb/hr boilers.—Babcock & Wilcox, Ltd. Doncaster station: Four 180,000 lb/hr boilers.—Mitchell Engineering, Ltd. Skelton Grange station, Leeds: 132 kV 2,500 MVA switchgear.—British Thomson-Houston Co., Ltd. Huddersfield station: Two 180,000 lb/hr boilers.—Bennis Combustion, Ltd. Stella South station, nr. Newcastle-upon-Tyne: Main foundations, etc.—Sir Robert McAlpine & Sons (Newcastle-upon-Tyne), Ltd.; 132 kV overhead line.—W. T. Henley's Telegraph Works Co., Ltd. Carrington station, nr. Manchester: 11.8 kV and low voltage cables.—British Insulated Callender's Cables, Ltd. Chadderton station, Oldham: Two 360,000 lb/hr boilers.—Simon-Carves, Ltd. Fleetwood station: Railway sidings.—Thos. W. Ward, Ltd. Braehead station, Renfrew: One 300,000 lb/hr boiler.—Babcock & Wilcox, Ltd. Slough: Two 120 MVA 275/132 kV auto-transformers.—General Electric Co., Ltd. Nelson substation, Lancs.: 30 MVA 132/33 kV transformers and earthing transformers.—Yorkshire Electric Transformer Co., Ltd. Devonside-Redhouse, S.E. Scotland: 132 kV overhead line.—Riley & Neate, Ltd.

Television Aerials

South Shields Town Council has asked the Association of Municipal Corporations to consider the question of local authorities obtaining a greater control and uniformity over the height and location of television aerials on private property.

Lighthouse Conversion

Electricity has been installed in two lighthouses on the south bank of the River Humber—the Killingholme High Light and Killingholme South Low Light—at a cost of over £1,000. Previously oil lamps have been used. Storage batteries are provided for use in the event of power cuts.

Batti-Wallahs' Society

THE chief guest at last week's luncheon of the Batti-Wallahs' Society was Air Chief Marshal Sir Philip Joubert, who in an address on the future of Coastal Command, spoke of the important part it played in anti-submarine warfare in the last war. In any future conflict electrical methods of detection would be increasingly used. Modern submarines could remain submerged for almost indefinite periods, and a combination of radar with some system of illumination would be required to detect them. Sir Philip also had something to say on standardization of electrical equipment. He mentioned some of the problems of adapting American equipment for use in this country during the war and he foresaw the problems which would arise with the formation of a European defence force.

There will be no luncheon of the Society this month. The chief guest at the next luncheon on 30th January will be Rear Admiral S. H. Raw. Mr. T. C. F. Bigland, the "Mate," announced that the annual ladies' night would be on 28th March and members would receive particulars in due course.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

The English Electric Co., Ltd., is to make a rights issue to raise £3,243,837. Ordinary stockholders will be offered 1,179,577 ordinary £1 shares at 55s per share in the proportion of two new shares for every £7 of ordinary stock held on 17th November.

Details have been announced of the private placing by Lazard Brothers & Co., Ltd., of £3,000,000 4½ per cent debenture stock 1972/77 at par. The new stock will rank *pari passu* in point of charge with the £3,000,000 4 per cent debenture stock 1965/85 issued last year. The growth of the business of the group (which since the last financing has been enlarged by the acquisition of 54 per cent of the share capital of the John Inglis Co., Ltd., Toronto) continues over almost the whole range of the group's normal products and a further large expansion has been superimposed by the Government rearmament programme. This year's turnover of the company in its normal business will be almost double that of 1948 and its order books point to a still higher output for some years to come. Exports continue to account for about 50 per cent in value of orders received other than those undertaken for the Government rearmament programme. In addition to the increased finance required for the further expansion of the company's business it is estimated that the capital expenditure incurred or to be incurred by the group in the years 1951 to 1953 is between £9 and £10 million.

The Perak River Hydro-Electric Power Co., Ltd., held its annual meeting on 30th November, Mr. H. G. Balfour (vice-chairman) presiding in the absence of the chairman, Mr. W. Shearer.

In his circulated statement the chairman said that the Chenderoh hydro station generated 197 million kWh. At the Malim Nawar steam station 105 million kWh was generated; the supply of Malayan coal was short of requirements and greater use was made of fuel oil. In view of the unsatisfactory coal position, arrangements were being made to augment supplies from Sumatra. A 9,350 h.p. synchronous motor was now being installed and would be used as a synchronous condenser for power factor correction. Batu Gajah steam station generated 51 million kWh, an increase of 118 per cent. Work was in hand on the installation of the new 80,000lb/hr boiler which should be completed during 1952, and an additional 7,500 kW set was being installed which should be ready for service in the latter part of 1952. Continuity of supply had been interrupted to some extent by bandits. On ten occasions, towers had been felled by cutting or by dynamite.

The Ebonite Container Co., Ltd., reports a profit for the year ended 31st March last of £101,511, as compared with £87,830 for the preceding year, to which is added sundry credits making £106,513. After providing £47,000 for taxation and £4,787 for depreciation, the net profit is £47,844 (against £40,837). Allocations to various reserves total £55,122. It is proposed to pay a final ordinary dividend of 13 per cent, making 17½ per cent for the year on increased capital. The balance carried forward is £38,651 (against £54,562 brought in). The consolidated profit and loss account shows a group profit of £230,203 (against £143,241), and after meeting taxation and other charges, a net balance of £97,871 (against £61,456).

In his circulated statement, Mr. W. E. Smith (chairman and managing director) says that both the parent and the subsidiary company have again had a satisfactory year. A considerable amount of additional plant has been installed in their Manchester works. Several new processes have been brought into operation, and further plant is being installed. They have acquired a lease of a factory adjoining their London works, but it will be some time before the effects of this addition become apparent.

Joseph Lucas, Ltd.—The main figures for the financial year ended 31st July last were published in our issue of 23rd November. The directors state in their report that as the company has, in effect, become a holding company it is proposed to change the name to Joseph Lucas (Industries), Ltd. It is also proposed to recommend the issue to the Lucas workers' share bank of a further 300,000 redeemable preference shares for cash at par, which will enable the present number of depositors to be doubled.

James Howden & Co., Ltd., are holding an extraordinary meeting on 19th December at which a resolution will be submitted that £21,138 standing at the credit of dividend reserve be applied in payment of a special dividend in respect of the year ended 30th April last of 3d per 5s unit, less tax. When announcing the final dividend of 10 per cent last September, the directors stated that this

was the maximum allowed under the White Paper on control of dividends. It was proposed that £21,138 representing a further 5 per cent be transferred to dividend reserve.

Lisbon Electric Tramways, Ltd., is paying an interim dividend of 2½ per cent, tax free (unchanged).

Hick, Hargreaves & Co., Ltd., have declared an interim dividend of 5 per cent (against 2 per cent), on increased capital. The increased interim is in accord with the new policy of approximating interim to final dividends.

Johnson, Matthey & Co., Ltd., have declared an interim dividend of 3 per cent (same) on larger capital.

George Kent, Ltd., are paying an unchanged interim dividend of 3 per cent.

New Companies

Alsheath, Ltd.—Registered 29th November. Capital £1,000. To adopt an agreement dated 25th October, 1951, and made between the Loewy Engineering Co., Ltd., and British Insulated Callender's Cables, Ltd., and to establish and maintain research laboratories and experimental workshops, etc. The first chairman is J. L. Harvey. Regd. office: Norfolk House, Norfolk Street, W.C.2.

Broughton Installations, Ltd.—Registered 16th November. Capital £1,000. Electrical contractors and engineers, contractors for the installation of television and radio apparatus, etc. Directors: F. W. J. B. Pigott, B. Lyon-Williams and F. E. Betteridge. Regd. office: 80, Woodcote Road, Wallington, Surrey.

Midland Wireless (Bedford), Ltd.—Registered 19th November. Capital £10,000. To acquire the business of radio and television manufacturers, wholesalers and factors, electrical engineers and retailers carried on by the Midland Wireless and Electrical Appliance Co., Ltd., at 76, Midland Road, Bedford, and 112, Leavesden Road, Watford. Directors: J. E. M. Johns and E. J. Walker. Solicitor: E. H. Stevens, 17, College Road, Harrow, Middx.

Radio-Electronic Engineering (Wembley), Ltd.—Registered 15th November. Capital £1,000. Directors: R. M. Francis, Kathleen J. Francis and D. C. Willis. Regd. office: 2a, Parkfield Parade, South Harrow, Middx.

Increases of Capital

Max Stone, Ltd.—Increased by £390,000, in 560,000 6 per cent cumulative preference shares of 10s each and 1,100,000 ordinary shares of 2s each, beyond the registered capital of £210,000.

Parmeko, Ltd.—Increased by £20,000, in £1 ordinary shares, beyond the registered capital of £90,000.

Holophane, Ltd.—Increased by £50,000, in 5s ordinary shares, beyond the registered capital of £100,000.

Shoolbred Electrical Co., Ltd.—Increased by £7,000, in £1 6 per cent cumulative 1st preference shares, beyond the registered capital of £5,000.

Meeting of Creditors

R. G. Joslin & Co. (Electrical), Ltd.—A meeting of creditors is called for 12th December at 100, Park Street, London, W.1. for the purposes provided for in Sections 294 and 295 of the Companies Act, 1948.

Liquidation

Elevcel, Ltd.—Winding up voluntarily. Liquidators, Messrs. W. P. Scowcroft and G. D. Christie of Automatic Telephone & Electric Co., Ltd., Strowger Works, Liverpool, 7.

Bankruptcies

W. D. Newell, 35, Duke Street, Padstow, Cornwall, radio and electrical engineer.—Receiving order made 23rd November on debtor's own petition.

S. H. Ireland and **V. Thomason,** carrying on business in co-partnership under the style of Ireland, Thomason & Co., at 61, Market Place, Malton, and also at 110, Willowgate, Pickering, Yorks., electrical contractors and radio engineers.—Receiving order made 22nd November on debtor's own petition. First meeting 7th December at the Official Receiver's office, 29, East Parade, Leeds. Public examination 5th February at the Court House, Castle Road, Scarborough.

W. A. Prince and **C. S. Prince,** carrying on business at 69, Princess Street, Manchester, in partnership as electrical contractors under the firm name of "Prince Brothers".—Application for discharge to be heard on 14th January at the Court House, Quay Street, Manchester.

H. Busfield, formerly carrying on business at 6, Wilfield Street, Burnley, as an electrical engineer.—Last day for receiving proofs for dividend 11th December. Trustee, Mr. F. C. Ormrod, 20, Byrom Street, Manchester, 3, Official Receiver.

B. Goldenberg, described in the receiving order as B. Goldie & Co., carrying on business at 49, Deansgate, Manchester, dealer in electrical goods.—First and final dividend of 3s 3d in the £, payable on or after 5th December at the Official Receiver's office, 20, Byrom Street, Manchester, 3.

STOCKS and SHARES

TO-DAY'S record of price fluctuations of the various stocks and shares given in our monthly tables makes melancholy showing as compared with that of a month ago. There are some 75 falls, against a couple of rises. The main reason for this unusual state of affairs is the advance in money rates which was emphasized by a rise of 10s per cent, to 2½ per cent, in Bank Rate. This followed the uneasy anticipation aroused through the forthcoming imposition of E.P.T., due to be announced early in the New Year. The shrinkage in gilt-edged securities, lowering the yield per cent on the latter as it did, spread, naturally enough, to other issues, ordinary and preference alike. Investment now is demanding higher returns on all securities. Business in the Stock Exchange is on the quiet side for the time being but there is still a fair demand for industrial shares of the best type. In a surprising number of cases, a marked shortage of stock becomes evident when prospective buyers appear.

English Electric "Rights"

Talk of an issue on the part of English Electric has been current for some time, being associated with the overdraft of £4¼ million appearing in the last balance sheet. Nevertheless, the shares suffered the usual reaction on the actual decision. They stand now at 60s, which compares with 65s immediately before the announcement. Shareholders are to be offered new shares in the proportion of two at 55s, for every seven now held. On the basis of the present quotation the "rights" work out at 1s 6d per share. The new shares are changing hands around 4s 6d premium. In the market, maintenance of the dividend at the current rate of 15 per cent on the capital so increased, is regarded as a reasonably safe assumption. This being so, and allowing for the value of the "rights," the shares give the prospective yield of a round 5 per cent. Later, the company announced that an issue of £3 million debenture stock, bearing 4½ per cent interest and redeemable 1972–77 was being privately placed: the two issues will raise over £6 million of new money.

E.M.I. Accounts

Electric & Musical Industries 10s shares hardened to a little over 20s following publication of the full accounts. They now offer a yield of nearly 6 per cent on the 12 per cent dividend which materialized after the removal of the last Government's dividend restriction plans. In the profit and loss account, there is shown to be good cover for the payment, which involves the distribution of only £183,000 net out of the available group profit of £652,000. The surplus retained in the business, plus special credits, has raised the total of reserves above the amount of ordinary capital. In other respects the balance sheet reflects the present-day trend in the big expansion of stocks and debtors at the expense of cash resources.

Coming Offers

Market reactions to new share issues have become so monotonously adverse that the tendency now is for share prices concerned to be marked down almost automatically on news of this kind, or upon the mere hint of it. Much to the point are the falls which have taken place, since last week, in the quotations for the ordinary shares of Enfield Cables and the English Electric Co. Enfields have come back from 33s to 30s on the proposal to issue 400,000 shares, on terms not yet decided. Elsewhere, Crompton Parkinsons, now 11s, have been noticeably subdued since references in the annual report to the question of replacing temporary loans by a more permanent form of capital. Erratic behaviour recently on the part of Imperial Chemical Industries shares accompanied rumours, since officially denied, of a coming issue of ordinary. From a different point of view, many outside investors watch for these occasions in order to pick up good shares at something below the previous market level, and are often well paid for this opportunism.

Brook Motors Dividend

Brook Motors 10s ordinary shares were introduced to the London and Huddersfield Stock Exchanges early this year, and, having fluctuated since within the comparatively narrow limits of 32s 6d to 38s 6d, are quoted now at 35s ex the final dividend of 15 per cent declared a fortnight ago. This made a total of 20 per cent for the year ended in September, and may be compared with the figure of at least 17½ per cent mentioned in the statement made at the time of the marketing of the shares. A forecast at the same time that profits would exceed substantially those of the previous year has also proved justified, for the full accounts show trading profits of £556,000 against £386,000 previously. On present terms, the shares pay £6 3s per cent on the money. The company's 5 per cent redeemable preference shares are quoted at about par.

New Refrigeration Company

Glover & Main, Ltd., have announced the registration of a new subsidiary company, Main Refrigeration, Ltd., with an authorized capital of £100,000. The new concern is to produce an absorption-type refrigerator for operation by town or butane gas, electricity or kerosene, and may at a later stage develop air conditioning equipment.

Electrical Investments

Past Month's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price Nov. 30 1951	Month's Rise or Fall	Est. Yield £ s. d.
Overseas Electricity Companies					
Atlas Elec. ..	3	4	20/-	—1/6	4 0 0
Calcutta Elec. ..	6†	6†	21/3	—$\frac{1}{16}$	5 13 0†
Cawnpore Elec. ..	—	—	32/6	—$\frac{1}{8}$	—
East African Power	7	7	34/-	—2/-	4 2 4
Jerusalem Elec. ..	—	—	10/-	+$\frac{1}{16}$	Nil
Madras Elec. ..	—	—	28/6	—	Nil
Nigerian Elec. ..	10	10	30/-	—	6 13 4
Palestine Elec. "A"	5†	5†	17/-	—1/6	5 17 8†
Perak Hydro-Elec.	Nil	Nil	12/-	—1/6	Nil
Equipment and Manufacturing					
Aberdare Cables(5/-)	20	20	13/9	—6d	7 5 6
Aron Elec. Ord. ..	15	15	42/6	—	7 1 2
Assoc. Elec. Ord.	15	20	85/-	—5/-	4 14 1
Automatic Tel.&El.	12½	15	68/3	—5/-	4 7 3
Babcock & Wilcox	15	18	72/6	—5/-	4 19 4
Baldwin, H. J. (2/-)	25	25	5/3	—6d	8 17 8
British Aluminium	10	10	41/6	—$\frac{1}{16}$	4 16 5
B.I. Callender's ..	6¾	7½	33 -	—2/-	4 11 0
British Thermostat (5/-)	30	30	32/6	—	4 12 4
British Vac.Cleaner (5/-)	20	25	16/6	—1/6	7 11 6
Brush Ord. (5/-) ..	10	10	6/6	—	7 13 10
Burco (5/-) ..	42½	38⅜	22/6	—2/-	8 12 0
Chloride El.Storage	12½	15	65/-	—5/-	4 12 4
Cole, E. K. (5/-) ..	20	25	18/6	—1/9	7 0 6
Cossor, A. C. (5/-)	Nil	Nil	14/6	—9d	Nil
Crabtree (10/-) ..	17½	17½	37/6	—¼	4 13 4
Crompton Parkinson Ord. (5/-) ..	22½	11¼*	11/-	—6d	5 2 3
De La Rue (5/-) ..	50	50	32/6	—3/3	7 14 0
Decca (1/-) ..	112½	112½	19/6	—2/-	5 15 6
E.M.I. (10/-) ..	8	12	20/-	—2/3	6 0 0
Electrical Components (5/-) ..	20	20	12/-	—	8 6 8
Elec. Construction	15	15	63/9	—	4 14 4
Enfield Cable Ord.	7½	7½	30/-	—5/-	5 0 0
English Electric ..	10	15	60/-	—7/6	5 0 0
Ericsson Tel. (5/-)	20†	22†*	43/3	—$\frac{5}{16}$	2 10 8†
Ever Ready (5/-)..	35	35	29/-	—2/9	6 0 8
Falk Stadelmann	15	15	45/-	—$\frac{3}{16}$	6 13 4
G.E.C. Ord. ..	17½	22½	90/6	—5/-	4 19 6
General Cables (5/-)	38	30*	18/3	—	8 4 4
Greenwood & Batley	15	15	50/6	—1/6	5 18 10
Hackbridge Cable (5/-)	20	20	11/3	—$\frac{1}{16}$	8 17 10
HackbridgeHewittic (5/-)	15	18	17/-	—$\frac{1}{16}$	5 6 0
Hall Tel. Acc.(10/-)	10	10	13/6	—1/-	7 8 2
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (5/-) ..	20	20	21/-	—2/-	4 15 3
Hoover (5/-) ..	45	30*	30/9	—2/-	4 17 7
Intl. Combustion (5/-)	21	20*	20/6	—6d	4 17 7
Johnson & Phillips	15	15	58/6	—4/9	5 2 7
Equipment and Manufacturing (continued)					
Lancashire Dynamo	22½	22½	47/6	—5/-	4 14 [illegible]
Laurence,Scott(5/-)	12½	12½	12/9	—1/-	5 1 [illegible]
London Elec. Wire	10	10	46/3	—½	4 6 [illegible]
J. Lucas	17½	7½*	37/-	—4/3	4 1 [illegible]
Mather & Platt ..	11	12½	43/3	—3/-	5 15 [illegible]
Metal Industries ..	10	10	41/-	—½	4 17 [illegible]
Mid. Elec. Mfg. ..	12½	15	65/-	—½	4 12 [illegible]
Murex	10	12½	55/6	—1/6	4 10 [illegible]
Newman Ind. (2/-)	10	6	2/9	—	—
Oldham & Son (1/-)	30	30	4/9	—6d	7 17 10
Parsons, C. A. ..	15	15	52/6	—$\frac{5}{16}$	2 17 [illegible]
Plessey (5/-) ..	20	22½	20/-	—	5 0 0
Pye Deferred (5/-)	35	18*	21/6	—3/6	4 3 [illegible]
Radio & Tel. (2/-)	—	—	9d	—	Nil
Revo (10/-) ..	27½	27½	42/-	—1/9	6 11 0
Reyrolle	15	15	41/3	—5/9	3 12 10*
Scophony Baird(1/-)	—	—	1/4½	—1½d	Nil
Scot. Cable (4/-) ..	30	30	24/-	—1/6	5 0 0
Siemens Ord. ..	7½	10	42/6	—½	4 14 1
Switchgear&Cowans (5/-)	20	22½	16/3	—	6 18 6
T.C.C. (10/-) ..	15	20	43/9	+½	4 11 4
T.C. & M... ..	9*	10*	40/-	—3/6	5 0 0
TelephoneMfg.(5/-)	10	10	9/-	—1/-	5 11 1
Thorn Elec. (5/-)..	20	10*	10/-	—	5 0 0
Tube Investments	25	25	5½	—$\frac{5}{8}$	4 5 0
Vactric (5/-) ..	Nil	Nil	8/-	—2/-	Nil
Veritys (5/-) ..	2½	Nil	3/9	—9d	Nil
Walsall Conduits (4/-)	70	70	61/3	—¼	4 11 6
Ward & Goldstone (5/-)	44	45*	41/6	—3/6	5 8 5
Watford (2/-) ..	20	25	6/9	—6d	7 8 10
Westinghouse Brake	14	14	58/9	—$\frac{1}{16}$	4 15 3
West. Allen (5/-)..	10	12½	11/3	—1/-	5 12 4
Transport and Communications					
Anglo-Am. Tel.: A Ord.	—	—	93½	—7½	—
Ord.	—	—	65	—	—
Anglo-Portuguese	8	8	24/-	—	6 13 4
Brit.Elec.Traction: Def. Ord. ..	22½	25	455	—20	5 9 8
Cable & Wireless: Ord.	—	6	117½	—7	5 2 2
4% Loan ..	4	4	98	—1¼	4 1 8
Calcutta Trams ..	6†	6†	26/6	+1/-	4 10 7
Cape Elec. Trams	4	5	16/-	—6d	6 5 0
Globe Tel. & Tel. Ord.	—	—	25/-	—¼	5 12 0
Great Northern Tel. (£10)	7½	8	11¼	—½	7 2 3
Inter. Tel. & Tel.	Nil	15cts	31	—1	—
Marconi Marine ..	7½	10	36/3	—$\frac{1}{16}$	5 10 [illegible]
Oriental Tel. Ord.	16	16	48/9	—3/3	—
Telephone Props.	7	8	35/-	—$\frac{5}{8}$	4 11 [illegible]
Tele. Rentals (5/-)	10	10	9/6	—6d	5 5 [illegible]

* After capital bonus.
† Dividends are paid free of Income Tax.

NEXT WEEK'S EVENTS

Monday, 10th December

BIRMINGHAM.—Grand Hotel, 6.15 p.m. I.E.E. South Midland Supply & Utilization Group. "Motive Power in the Factory," by H. Dreghorn.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. "The Life and Work of Oliver Heaviside," by Prof. G. H. Rawcliffe.

KINGSBURY.—Prince of Wales Hotel, Kingsbury Road, N.W.9, 7.45 p.m. A.S.E.E. North West London Branch. "Variable Speed a.c. and d.c. Motors," by L. W. Marshall.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 7 p.m. I.E.S. Leeds Centre. "Architecture and Lighting."

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "The van der Graaf Generator as a Million Volt d.c. Source," by D. H. Howis and R. J. Ryan.

Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Protection of Electrical Networks and Plant," by Mr. Edgley.

St. Ermin's Hotel, Caxton Street, S.W.1, 7 p.m. A.S.E.E. Central London Branch. "Air Conditioning and its Applications," by H. G. Y. Green.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Variable-Voltage Generation applied to a.c. Power Systems," by R. L. Chantrill.

NOTTINGHAM.—East Midlands Gas Board Showrooms, Parliament Street, 6.30 p.m. Nottingham Society of Engineers. "Modern Industrial Instrument Design and Application," by H. S. Parslow.

READING.—George Hotel, King Street, 7 p.m. Institution of Electrical Engineers. District meeting. "The Heat Pump and its Importance to the Electrical Industry," by M. V. Griffith.

Tuesday, 11th December

BELFAST.—Presbyterian Hostel, 6.45 p.m. I.E.E. Northern Ireland Centre. "Electrical Control of Dangerous Machinery and Processes: Part II (Electrically Interlocked Guards on Machines) and Part III (Remote Supervisory Control)," by W. Fordham Cooper.

GLASGOW.—At the Institution of Engineers & Shipbuilders, 39, Elmbank Crescent, 7 p.m. I.E.E. Scottish Centre. "Nuclear Particle and Radiation Detectors," by Dr. D. Taylor and J. Sharpe.

LEEDS.—B.E.A. Offices, Yorks Division, 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. "Load Shedding," by H. C. Ogden and H. Lloyd.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. "A Graphical Analysis for Non-linear Systems," by Miss Pei-Su Hsia. (To be read by Prof. M. G. Say.) "A System Utilizing Coarse and Fine Position Measuring Elements simultaneously in R.P.C. Servo-Mechanisms," by J. C. West.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "Dark Adaptation," by W. J. Wellwood Ferguson.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Supply Group. "The Protection of Electrical Power Systems—A Critical Review of Present-Day Practice and Recent Progress," by H. Leyburn and C. H. W. Lackey.

NEWPORT (MON).—Tredegar Arms Hotel, 7 p.m. Newport and District Electric Club. "Projection Television," by Mr. Butler.

RUGBY.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre Students' Section. "Fluorescent Lamps and Lamp Circuits," by L. J. Gardner.

WIMBLEDON.—St. George's Hall, St. George's Road, 8.15 p.m. A.S.E.E. South West London Branch. "Branch Lecturettes."

Wednesday, 12th December

ABERDEEN.—Caledonian Hotel, Union Terrace, 7.30 p.m. I.E.E. North-East Scotland Sub-Centre. "A Survey of Modern Methods of Preservation of Instrument Readings and Recordings," by L. B. S. Golds.

BIRMINGHAM.—James Watt Memorial Institute, 6.45 p.m. I.E.E. South Midland Students' Section. Senior chairman's address, by W. H. Brent.

BLACKBURN.—N.W.E.B. Demonstration Theatre, Darwen Street, 7 p.m. I.E.E. North Lancashire Sub-Centre. "Standardization and Simplification in the Electrical Industry," by J. T. Moore.

BOURNEMOUTH.—Grand Hotel, 6.30 p.m. I.E.E. Southern Centre. District meeting. "An Electronic Process Controller," by J. R. Boundy and S. A. Bergen.

BRADFORD.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "The Science of Electronics," by R. A. Chelloner.

COVENTRY.—Technical College, 7.15 p.m. A.S.E.E. Coventry Branch. "Earthing," by P. W. Cave.

EDINBURGH.—Welfare Club Hall, City Lighting & Cleansing Department, 357, High Street, 7 p.m. I.E.S. Edinburgh Centre. "Light and Crime," by W. Merrilees.

LIVERPOOL.—The Temple, Dale Street, 6 p.m. I.E.E. Mersey & North Wales Centre. "The Liverpool Overhead Railway—A Pioneer in Rapid Transit," by H. M. Rostron. (Joint meeting with the Liverpool Engineering Society.)

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "Activity Methods in Technical Education," opened by R. D. Watts.

St. Bride's Institute, E.C.4, 6.30 p.m. Institution of Engineers-in-Charge. "Electrical Pre-treatment of Water to Prevent Scale Formation," by A. G. Freeborn.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "Some Operating Experience with High-Pressure Steam Power Plant," by W. N. C. Clinch. (Joint meeting with the Yorkshire Branch of the Institution of Mechanical Engineers.)

Thursday, 13th December

DUNDEE.—Royal Hotel, Union Street, 7 p.m. I.E.E. North-East Scotland Sub-Centre. "A Survey of Modern Methods of Presentation of Instrument Readings and Recordings," by L. B. S. Golds.

Thursday, 13th December—(*cont.*)

GLASGOW.—At the Institution of Engineers & Shipbuilders, 39, Elmbank Crescent, 6.30 p.m. I.E.S. Glasgow Centre. "Church Lighting," by L. C. Rettig.

HULL.—Y.E.B. Offices, Ferensway, 7.30 p.m. I.E.E. North Midland Centre. District meeting. "Design of Power Transformers to withstand Surges due to Lightning, with special reference to a New Type of Winding," by A. T. Chadwick, J. M. Ferguson, D. H. Ryder and G. F. Stearn.

LEEDS.—B.E.A. Yorks Division Offices, 1, Whitehall Road. E.P.E.A. West Yorkshire Technical Group. "Oil for the Power Industry," by C. F. McCue.

LEICESTER.—E.M.F.B. Demonstration Theatre, Charles Street, 6.30 p.m. I.E.S. Leicester Centre. "What I have learned about Lighting from the Festival," by T. O. Freeth.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilization Section. "The Characteristics and Control of Rectifier-Motor Variable-Speed Drives," by P. Bingley.

London School of Hygiene & Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers. "Electronic Analogues of Physiological Processes," by Dr. W. G. Walter and H. W. Shipton.

Caxton Hall, S.W.1, 2.30 p.m. Diesel Engine Users' Association. "Report on Heavy-Oil Engine Working Costs, 1949–50."

MANCHESTER.—Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. "Brightness Engineering," by W. Robinson.

MIDDLESBROUGH.—Cleveland Scientific & Technical Institute, Corporation Road, 6.30 p.m. I.E.E. Tees-Side Students' Section. Film show.

TYTHING.—Talbot Hotel, 7.15 p.m. Worcester Electric Club. "Modern Resistance Welding Machines," by A. G. Galle.

Friday, 14th December

BRISTOL.—Grand Hotel, 7.30 p.m. A.S.E.E. Bristol Branch. "Lighting—Theory and Practice," by R. S. Hazell.

LONDON.—At the Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7.30 p.m. Junior Institution of Engineers. Inaugural meeting and presidential address by Air Commodore F. R. Banks on "Enterprise in Engineering."

NEWCASTLE-ON-TYNE.—Eldon Grill, Grey Street. I.E.E. North-Eastern Students' Section. Smoker.

NOTTINGHAM.—Electricity Showrooms, Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "Motor Control Gear," by P. C. Belton.

STOKE-ON-TRENT.—Copeland Arms Hotel, Glebe Street, 7.30 p.m. A.S.E.E. Crewe Branch. "Television," by R. V. Peters.

Saturday, 15th December

LONDON.—I.E.E. London Students' Section, 10.15 a.m. Visit to B.E.A. Control Centre, St. Paul's.

Imports of Kenya and Uganda

THE electrical import trade of Kenya and Uganda declined slightly in 1950 but considering the increase that had taken place between 1948 and 1949 results were not unsatisfactory. The values of the chief items in 1950 are given in the accompanying table, with notes of increases or decreases on the previous year. A bright spot was the continued growth in imports of communication equipment and cable and wire.

Class of Goods	1950 £ (000)	Inc. or dec. on 1949 £ (000)
Generators, motors, convertors and transformers	269	— 193
From United Kingdom	244	— 154
„ *United States*	13	— 30
Batteries and accumulators for motor vehicles	139	+ 45
From United Kingdom	122	+ 40
„ *South Africa*	5	+ 4
Lamp and torch batteries	36	— 22
From United Kingdom	1	— 1
„ *South Africa*	16	— 5
„ *Malaya*	18	— 15
Other batteries and accumulators	7	— 3
From United Kingdom	5	+ 1
Bulbs and tubes for lighting, domestic	22	— 10
From United Kingdom	13	— 1
„ *Holland*	9	— 6
Ditto, for torches and handlamps	5*	— 5
Radio receiving sets, domestic	78	— 37
From United Kingdom	37	— 33
„ *Holland*	38	— 2
Ditto, other, and spares	98	+ 70
From United Kingdom	94	+ 77
„ *Holland*	3	—
Telegraph and telephone instruments and apparatus	286*	+ 117
Insulated cables and wires	581	+ 131
From United Kingdom	538	+ 177
„ *South Africa*	31	+ 10
„ *Italy*	9	+ 9
Portable tools and appliances and small household electrical devices not exceeding 15 kg	31*	— 15
Electrical appliances for motor vehicles, cycles and i.c. engines	67	+ 19
From United Kingdom	43	+ 10
„ *Australia*	2	— 1
„ *United States*	6	— 2
Torches, complete or excluding batteries and bulbs	28	— 15
From United Kingdom	1	— 1
„ *Hong Kong*	26	— 20
Lighting fixtures	319*	— 12
Other appliances and apparatus	263	+ 50
Parts and accessories, unspecified	202	— 194

* Mainly from U.K.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) will be obtainable after 16th January from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

24770. Western Union Telegraph Co.—Electric space-discharge devices. 20th August, 1946. (665092.)

1947

8666. Kolster Brandes, Ltd., Chapman, R., and Trier, H. H.—Devices for the conversion of electric signals into sound. 25th March, 1948. (664812.)

9775. Liebmann, G.—Reduction of primary spherical aberration in magnetic electron lenses. 12th April, 1948. (665094.)

20727. Broadway, L. F., and Bull, E. W.—Television receiving apparatus. 6th July, 1948. (665096.)

23920. McGee, J. D.—Apparatus embodying electron-discharge tubes. 23rd July, 1948. (664813.)

24378. Cholet, E., and Whitaker, C. R.—Electron-discharge devices. 1st September, 1948. (664814.)

28242. Brush Development Co.—Method of manufacturing piezo-electric crystal devices. 22nd October, 1947. (665100.)

35408. Poirette, P.—Photo-electric exposure meter. 31st December, 1947. (664818.)

1948

820. Philips Electrical, Ltd.—Circuits and relays for gas-filled discharge tubes. 10th January, 1948. (664911.)

2582. British Thomson-Houston Co., Ltd.—Electrical circuits for use with discharge devices. 28th January, 1948. Cognate application 2583, 24th July, 1947. Addition to 658750. (665103.)

3162. Anglo-Iranian Oil Co., Ltd., and Maclean, T. T.—Electric torches. 2nd February, 1949. (665104.)

8127. British Thomson-Houston Co., Ltd.—Condensation products of furfural and monohydroxybenzenes. 18th March, 1948. (665110.)

9999. British Thomson-Houston Co., Ltd., Anderson, J. T., and Wells, R. S.—Luminescent materials. 12th April, 1949. (664822.)

10109. Liebmann, G.—Reduction of chromatic aberration in magnetic electron or ion lenses. 12th April, 1948. Divided out of 665094. (665111.)

10403. Martenot, M.—Electro-acoustic transducers. 14th April, 1948. (664823.)

20719. Enfield Cables, Ltd., and Milner, R. C.—Terminations and joints for electric cables and artificial resins adapted for use therein. 3rd August, 1949. (665202.)

27431. Anglo-Iranian Oil Co., Ltd., and MacLean, T. T.—Flameproof electric torches. 21st October, 1949. (665115.)

27830. Directie van de Staatsmijnen in Limburg.—Preparation of krypton with xenon. 26th October, 1948. (664838.)

28676. Brush Development Co.—Magnetic recording apparatus. 4th November, 1948. (664994.)

31798. Noyes, R. C. (Compagnie Générale d'Electricité).—Apparatus for charging a variable number of accumulators with substantially constant current. 8th December, 1948. (664996.)

32293. Armstrong, E. H., Bose, J. H., and Hull, R. E.—Radio detection and ranging systems. 14th December, 1948. (664999.)

32356. Metropolitan-Vickers Electrical Co., Ltd., Starling, P. P., and Taylor, J. E.—Apparatus for producing Jacquard or similar cards from coloured rectangular-based patterns. 14th December, 1949. (665205.)

33623. English Electric Co., Ltd., Ferguson, J. M., and Brown, C.—Electric circuits comprising electric discharge devices. 23rd December, 1949. (664843.)

1949

602. Bosch Ges., R.—Commutators. 8th January, 1949. (665116.)

991. Muirhead & Co., Ltd., and Alwin, F. T.—Bobbins for electric coils. 18th October, 1949. (664913.)

1887. Aircraft Radio Corporation.—Electrically shielded housings for vacuum tubes. 14th September, 1946. Divided out of 665093. (665122.)

2513. Electric & Musical Industries, Ltd.—Band-pass circuit arrangements. 18th January, 1950. (665012.)

2842. Crocchi, P.—Electrical generating system. 2nd February, 1949. Convention date not granted. (665128.)

3040. Mercer, R.—Telecommunication systems. 1st February, 1950. (665129.)

3323. British Thomson-Houston Co., Ltd.—Multi-position electric switches with indicators. 7th February, 1949. (665210.)

4817. Metropolitan-Vickers Electrical Co., Ltd.—Generators of electric oscillations having saw-tooth waveform. 13th February, 1950. (665132.)

5308. Centre National de la Recherche Scientifique.—Voltage dividers. 26th February, 1949. (665015.)

5431. Decca Record Co., Ltd., Roberts, G. E., and Copping, J. B.—Position indicating apparatus for use with radio navigation systems. 27th February, 1950. (665135.)

6426. Sonnenfeld, H.—Apparatus for stripping insulated wire. 9th March, 1949. (664925.)

6433. British Thomson-Houston Co., Ltd., and Keitley, R.—Ultra-high-frequency heating. 9th March, 1950. (664926.)

7909. Mallett, E.—Supply systems for electrified wire fences. 23rd March, 1950. (664931.)

8097. General Electric Co., Ltd., Britten, L. F., Jenkins, R. O., and Moss, J.—Dispersed getter elements and methods of manufacture thereof. 22nd March, 1950. Cognate application 29897, 22nd November, 1949. (664933.)

8591. Birmingham Aluminium Casting (1903) Co., Ltd.—Drums for supporting cables, pipes, and the like. 30th March, 1950. (665154.)

9855. Lucas, Ltd., J.—Pressure-sensitive electromagnetic means for controlling a liquid fuel supply. 3rd April, 1950. (664935.)

9903. Oestrich, H.—Hollow turbine or like blades. 12th April, 1949. (664938.)

11114. Metropolitan-Vickers Electrical Co., Ltd.—Roller conveyors for removing heavy articles such as from machines used in foundries. 24th April, 1950. (664946.)

11334. Plessey Co., Ltd.—Magnetic dust cores. 17th April, 1950. (665170.)

11436. English Electric Co., Ltd.—Electric transformers. 28th April, 1950. (664949.)

13301. General Electric Co., Ltd., and Sowter, A. B.—Kettles, tea-pots, or like vessels. 18th May, 1950. (664955.)

13597. General Electric Co., Ltd., and Willoughby, A. H.—Electric circuit arrangements for operating high-pressure metal-vapour electric discharge devices. 20th April, 1950. (664857.)

13598. Decca Record Co., Ltd., and O'Brien, W. J.—Radar systems employing rotating antennae. 18th August, 1950. (664858.)

14119. Hoover (Electric Motors), Ltd., and Starkey, C. V.—Thermal overload cut-outs for electrical apparatus. 12th May, 1950. (665181.)

14515. Automatic Coil Winder & Electrical Equipment Co., Ltd., Wilkins, S. R., and Attwood, W. H.—A.c. measuring instruments. 22nd June, 1950. (665183.)

14527. Vaughan Crane Co., Ltd., and Sadler, G. V.—Travelling electric hoist blocks. 27th January, 1950. (665184.)

14595. British Thomson-Houston Co., Ltd.—Combined grading and corona shields for electric transmission lines. 31st May, 1949. (664961.)

15805. British Thomson-Houston Co., Ltd.—Protective devices for liquid immersed electrical apparatus. 14th June, 1949. (665216.)

16077. Plessey Co., Ltd.—Electromagnetic relays. 16th June, 1950. (664963.)

16200. British Thomson-Houston Co., Ltd.—Cooking apparatus. 17th June, 1949. (665220.)

16914. Lewis, H. W.—Containers and particularly electric accumulators or secondary cells or batteries. 7th June, 1950. (665223.)

16929. Sroka, A.—Electrical apparatus for the treatment of rheumatism and kindred ailments. 27th June, 1950. (665028.)

17159. Krebs & Co., Ltd., and Krebs, E.—Continuous purification of the mercury circulated in alkali metal chloride electrolytic cells. 29th June, 1949. (665225.)

17832. Anderson, W. W.—Fractional h.p. electric motors. 22nd June, 1950. (665228.)

17917. Ferguson Radio Corporation, Ltd., and Lockyer, J. S.—Cathode-ray tubes. 5th July, 1950. (665230.)

17934. British United Shoe Machinery Co., Ltd.—Bonding together of two portions of material by use of the heating effect of a high-frequency electric field. 7th July, 1949. (664867.)

18899. Landis & Gyr Soc. Anon.—Turret clock with lighting tubes on the hands. 18th July, 1949. (664871.)

19618. Zucker, E.—Electric cables. 5th July, 1950. (665239.)

19640. Bottger, E. B.—Devices for automatically winding up flexible wires and the like. 26th July, 1949. Cognate application 19641, 10th March, 1949. (665240.)

20322. Philips Electrical, Ltd.—Ignition devices for discharge tubes with gas and/or vapour filling. 4th August, 1949. Cognate application 20323, 2nd December, 1948. (665245.)

20368. Bolton & Sons, Ltd., T., and Dalley, W. H. R.—Electric conductor terminations particularly for use in rail bonds. 2nd August, 1950. (664975.)

21717. Electrobloc, Ltd.—Electrically heated sterilizing and water heating apparatus. 26th July, 1950. (665041.)

22465. Hoover, Ltd.—Suction cleaners. 30th August, 1949. (665043.)

22700. Igranic Electric Co., Ltd.—Electric rotary switches. 1st September, 1949. (665044.)

22884. Automatic Telephone & Electric Co., Ltd.—Electrical control arrangements for carrier wave generators. 28th August, 1950. (664883.)

23489. British Tabulating Machine Co., Ltd.—Electrical calculating machines. 12th September, 1949. (665046.)

23635. Gulowski, J.—Method and means for removing sludge or other impurities from steam boilers and for simultaneously preventing the formation of boiler scale. 13th September, 1949. (664987.)

24167. E.M.P. Electric, Ltd., and Miles, W. W. J.—Electric cartridge fuses. 20th September, 1950. (665052.)

25020. International Resistance Co.—Electric resistor assemblies. 29th September, 1949. (665053.)

25599. Philips Electrical, Ltd., Bailey, C. E. G., and Sproul, R. W.—Mixing circuit arrangements for producing a triangular voltage wave. 5th October, 1949. (665056.)

26159. Western Electric Co., Inc.—Magnetrons. 12th October, 1949. (665059.)

26971. Akt.-Ges. für Technische Studien.—Supply of heat to thermal power plants. 20th October, 1949. (665062.)

27507. Chloride Electrical Storage Co., Ltd.—Watering devices for electric accumulators. 26th September, 1950. (665065.)

27513. Enfield Cables, Ltd., Klein, N., and Sutto[illegible], C. T. W.—Radioactive gaseous mixtures. 26th Octob[illegible], 1950. (665066.)

27755. Automatic Telephone & Electric Co., Ltd.—Electrical contact spring sets. 13th October, 19[illegible]. (665071.)

28344. British Telecommunications Research, Ltd., a[illegible] Holloway, D. G.—Balanced modulators. 18th Octob[illegible], 1950. (665074.)

29882. British Tabulating Machine Co., Ltd.—Ele[illegible]tronic counters. 22nd November, 1949. (664895.)

29915. British Thomson-Houston Co., Ltd.—Elast[illegible]fluid turbine. 22nd November, 1949. (664896.)

30043. Automatic Electric Laboratories, Inc.—Su[illegible]station circuits. 23rd November, 1949. (665081.)

30258. Sperry Corporation.—Bridge devices an[illegible] circuits for use at radio and higher frequencies. 25[illegible] November, 1949. (664898.)

30720. Rollinson, E. W. (Board of Trustees of Illino[illegible] University).—Magnetic induction accelerator for charge[illegible] particles. 30th November, 1949. (665085.)

31234. Blaha, F., Ehrenhaft, F., and Schedling, J.—Visual depiction of the lines of force in a magnetic field. 6th December, 1949. (664900.)

31424. British Thomson-Houston Co., Ltd.—Laminated magnetic cores particularly for transformers. 7th December, 1949. (665087.)

31553. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 8th December, 1949. (664902.)

32840. British Thomson-Houston Co., Ltd.—Transitory electro-responsive control apparatus. 22nd December, 1949. (664907.)

32965. Autophone, Ltd., and Rosenfelder, R. I.—Remote controlled impulse senders. 23rd December, 1949. (664908.)

33097. British Tabulating Machine Co., Ltd.—Means for sensing magnetic spots on a record member. 28th December, 1949. (664909.)

33119. Metropolitan-Vickers Electrical Co., Ltd.—Regulating systems employing photo-cells. 27th October, 1950. (665090.)

33365. Western Electric Co., Inc.—Sound film recording apparatus. 30th December, 1949. (665259.)

33370. British Thomson-Houston Co., Ltd.—Ceramic dielectrics. 30th December, 1949. (665260.)

1950

19834/5. Brush Development Co.—Method of manufacturing piezo-electric crystal devices. 22nd October, 1947. Divided out of 665100. (665189/90.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 21st December.

HAWK. No. B700,886. Class 7. Lighting dynamos for cycles.—Hawk, Ltd., Treforest Trading Estate, Pontypridd, Glam.

MIX-FINDER (design). No. 701,590. Class 7. Electric food mixers and parts included in Class 7.—Sunbeam Corporation, Chicago, Illinois, U.S.A. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

RELOREL. No. 699,319. Class 9. Electronic relays.—Ateliers de Constructions Electriques de Charleroi, Brussels, Belgium. Address for service, c/o Feeny & Feeny, 2[illegible], Charlwood Place, Westminster, London, S.W.1.

WAFAX. No. 699,696. Class 11. Electric light fittings included in Class 11, and refrigerating apparatus and parts included in Class 11.—Wades (Metal Spinners), Ltd., Arden Works, Fenton Road, Halifax.

FALCON. No. B695,152. Class 12. Railway rolling stock; omnibus and coach chassis, tramcars, electric battery-driven land vehicles, caravans, trailers (vehicles), locomotives, and internal combustion engines for land vehicles.—Brush Electrical Engineering Co., Ltd., Falcon Works, Nottingham Road, Loughborough.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our Official Notices" section, the date of the issue is given in parentheses.

Ashton-under-Lyne. — 17th December. Corporation. Electrical installation at the fire station. (See this issue.)

Australia. — BRISBANE. — 13th February. Electricity Commission of Queensland. Power cables and cable boxes. (C.R.E. (I.B.) 76903/51. Ten/3318.)*

CHARLEVILLE.—13th February. Town Council. Gas-cum-oil engine driven electrical generating plant. (C.R.E. (I.B.) 76905/51. Ten/3315.)*

Belfast.—4th January. City Council. L.p. condensate steam treatment plant at Victoria power station. (See this issue.)

Blackwell (Notts).—2nd January. R.D.C. Supply of h.v. and l.v. switchgear. (See this issue.)

Cambridge.—City Council. Equipment for replacement of gas street lamps by 140 W sodium lamps. (See this issue.)

India. — NEW DELHI. — 27th December. Directorate General of Supplies and Disposals. Supply of four electric pumping sets. (C.R.E. (I.B.) 76495/51. Ten/3294.)*

New Zealand.—AUCKLAND.—17th December. Auckland Electric Power Board. Supply of 6,295 yd of submarine cable and accessories. (C.R.E. (I.B.) 76271/51. Ten/3290.)*

Pakistan. — KARACHI. — 17th December. Government Department of Supply and Development. Supply of power transformers and switchgear. (C.R.E. (I.B.) 76490/51. Ten/3307.)*

Selkirk.—7th January. Corporation. Street lighting equipment. (See this issue.)

Sunderland.—20th December. Education Authority. Electrical installation in extensions to technical college. (See this issue.)

Wiltshire.—County Education Committee. Electrical installations in secondary modern school and kitchen/dining block, Moredon Road, Swindon. (See this issue.)

ORDERS PLACED

Acton.—Highways Committee. Installation of electric lighting in Western Avenue between Gipsy Corner and Park Royal Station (£3,124).—Revo Electric Co., Ltd.

Bradford.—Education Committee. Electrical installation works at the Buttershaw Infants' School (£2,301).—J. Carter & Sons (Bradford), Ltd.

Nottinghamshire.—County Welfare Committee Recommended. Electrical installation work at Mount Vernon Home (£806).—G. R. Burton (Retford), Ltd., Retford.

Swansea.—Corporation. Electrical installations in 148 houses on West Cross site, part 3 (£4,258).—South Wales Electricity Board (in lieu of tender withdrawn).

Torquay. — Housing Committee. Recommended. Electrical installations in 29 houses and 14 old people's dwellings on Marldon Road estate (£1,400).—Devon Electric & General Services, Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alcester.—Houses (34), on four sites; F. B. Andrews & Son, architects to R.D.C., 95, Colmore Row, Birmingham.

Aylesbury.—Houses (44) and flats (16), Southcourt; R. C. White, architect to T.C., 4, Temple Square.

Barnes.—County primary school, East Sheen (£51,742); J. Harrison, county architect, County Hall, Kingston-on-Thames.

Beverley.—Proposed new county hall, St. Mary's Manor estate; county architect, County Hall, Beverley.

Bolton.—Nursery, "Oakfield," Chorley New Road (£40,776); borough surveyor.

Bradford.—Public wash-house and slipper baths at Rupert Street; Thos. Obank & Sons, Ltd., Thackley, Bradford.

Bridgnorth (Salop).—Houses (34), Alveley No. 2 site, for R.D.C.; Buildings & Equipment (Sedgley), Ltd., Wolverhampton Road East, Wolverhampton.

Brighton.—Old people's home, Heath Hill Avenue (£31,804); Jeffery & Son, Ltd., builders, Portland Road, Hove.

Dwellings (139), North Brighton estate; borough engineer.

Coventry.—Schools programme, 1952: Broad Lane Secondary, Whitley Abbey Secondary, Foxford Secondary, Penny Park R.C. Primary, Howes Lane Primary, and Allesley Primary; city architect.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

Dewsbury.—Houses (232), Wakefield Road estate; town clerk, Town Hall.

Dukinfield. — Hostel for aged persons (£43,992); B. Armitage, Stockport Road, Gee Cross, Hyde.

Exeter.—Central hospital for South Western Regional Board; A. Gray, architect, 1, Clare Street, Bristol.

Hendon. — Factory, North Circular Road; National Cash Register Co., Ltd., Marylebone Road, N.W.1.

Hornchurch.—Grammar school (£207,000); Tooley & Foster, architects, Midland Bank Chambers, Buckhurst Hill.

Huddersfield.—Project for textile department at Technical College (about £240,000); H. Nuttall, borough architect, High Street Buildings.

Lancashire.—Stage 1 of Nelson College of Further Education; G. Noel Hill, county architect, Preston.

Leatherhead. — County primary school, Ashtead (first instalment to cost £29,570); J. Harrison, county architect, Kingston-on-Thames.

Leicester.—Pithead baths at Nailstone Colliery; H. S. Barnett, architect, 18, Milton Street, Nottingham.

Leyton.—Dwellings, Thornhill Road Development Area (88), and Livingstone College site (29); borough surveyor, Town Hall, E.10.

Liverpool.—Rebuilding shop and office block at 58/66, Lime Street for DuBarry, Ltd.; Roberts & Sloss, Ltd., 23, Baker Street, Liverpool.

New X-ray dept. at Birkenhead Children's Hospital, extension to X-ray dept. at Clatterbridge General Hospital and new X-ray dept. at Barrowmore Hospital; architect to Regional Hospital Board.

London. — GREENWICH. — Rebuilding St. Mark's Presbyterian Church, South Street; Llewellyn Smith & Waters, architects, 103, Old Brompton Road, S.W.7.

NORTH WOOLWICH.—Factory, Bidder Street: Universal Milling Co., Ltd., 20, Latona Road, S.E.15.

Manchester. — Factory; Tie Weaving Industry, Ltd., Cobden Street, Waterfall, Blackburn.

Adaptation of "A" and "B" blocks at Springfield Hospital (£122,600); architect to Regional Hospital Board, Sunlight House, Quay Street, Manchester.

Wash-house, Whitworth Baths, Openshaw (£54,000); P. B. Dingle, town clerk, Town Hall, 2.

Mold (Flints).—Houses (51), Bromley estate, for U.D.C.; Dutton & Peters, New Street, Mold.

Nottingham.—Secondary schools, Wollaton Park; R. M. Finch, city engineer, Guildhall.

Ten-storey teaching block at Technical College Buildings, Burton Street; F. G. Minter, Ltd., 4, Buckingham Gate, London, S.W.1.

Oxford.—Shops and maisonnettes, Barton site (£28,458); Knowles & Son, Ltd., builders, Holywell Street, Oxford.

Plymouth.—Showrooms and offices for Boots Pure Drug Stores, Ltd., Nottingham; Staverton Builders, Ltd., contractors, Totnes.

Rhyl.—Four-bay fire station, headquarters offices, workshops, officers' houses, etc., Coast Road; Flints county architect, Llwynegrin, Mold.

Rochdale.—Secondary modern school at Kirkholt; borough surveyor, Town Hall.

Sheffield.—Second section of Charles Clifford Dental Hospital (about £94,000); board of governors of United Sheffield Hospitals.

Sleaford.—Houses (26), Galley Hill site, for U.D.C.,; F. J. Lenton & Partners, architects, 15, Broad Street, Stamford.

South Shields. — Four-storey business premises at the Market Place for Allen & Co., drapers; S. W. Milburn & Partners, architects, 9, Esplanade, Sunderland.

Stevenage.—Houses (394), Bedwell East site; Stevenage Development Corporation, Aston House.

Stockport.—Schools programme, 1952-55.—Nangreave Road R.C. Secondary Modern, Brinnington C.P. School, stage 1, and Offerton Secondary Modern Girls' School; schools architect, Town Hall.

Stourport. — Secondary modern school (£96,127); T. Vale & Sons, Ltd., Lombard Street, Stourport.

Stretford.—Factory reconstruction and extension for British Oxygen Co., Ltd., Westinghouse Road; E. M. K. Ellerton, staff architect, Bridgewater House, Cleveland Row, London, S.W.1.

Surbiton. — Factory extensions; Siebe-Gorman, Ltd.; Davis Road, Kingston By-pass.

Swinton.—R.C. secondary school, Stanwell Road; W. & J. B. Ellis, architects, Barclays Bank Buildings, St. Helens.

Tynemouth.—Blocks of flats at the east end of North Shields (£641,000); borough engineer, Northumberland Square, North Shields.

Wakefield.—Houses (38), on various sites; R.D.C. surveyor.

Wallsend.—Houses (100) under next year's building programme for T.C. Builders: J. H. James, Archer Street, Wallsend (60) and Armstrong (Builders), Ltd., Kenton, Newcastle (40).

Wembley.—Flats (90), Harrow Road and Church Lane; borough engineer.

West Bromwich.—Scheme for four new schools:—Grammar school at Churchfields (£53,000); nursery-infants' at Harvills Hawthorn (£20,000); infants' at Spon Lane (£33,600); and secondary modern, Hill Farm, Hamstead (£122,400); H. Schofield, borough engineer.

Windsor.—First section of East Berks college of further education (£40,000); county architect, Parkside Road, Reading.

Woking.—School, Sheerwater West; county architect, County Hall, Kingston-on-Thames.

Workington.—Houses (72), Northside estate; borough surveyor.

Worthing. — Houses (100), Field Place; borough engineer.